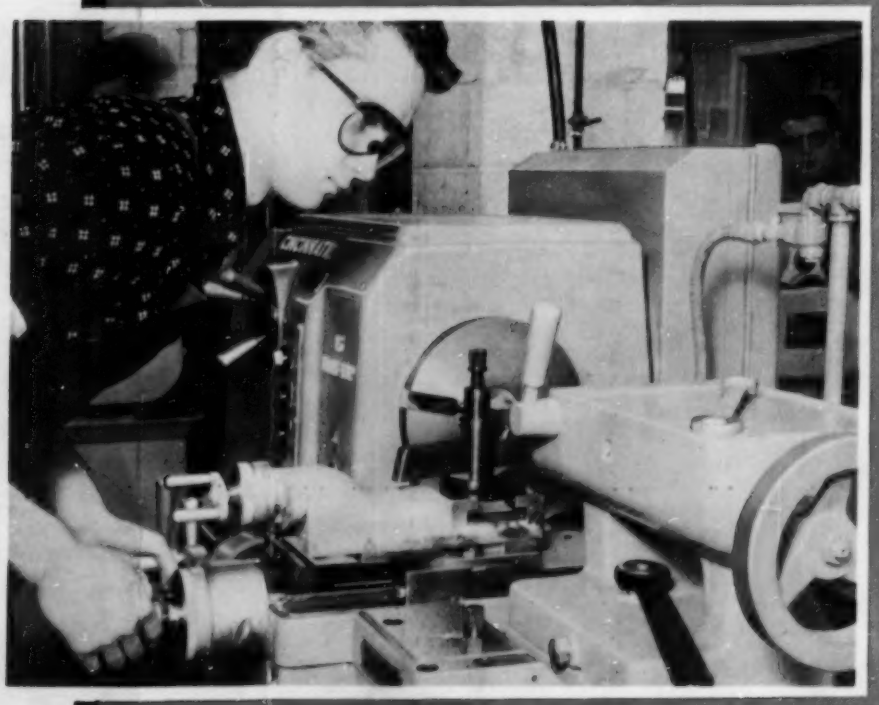
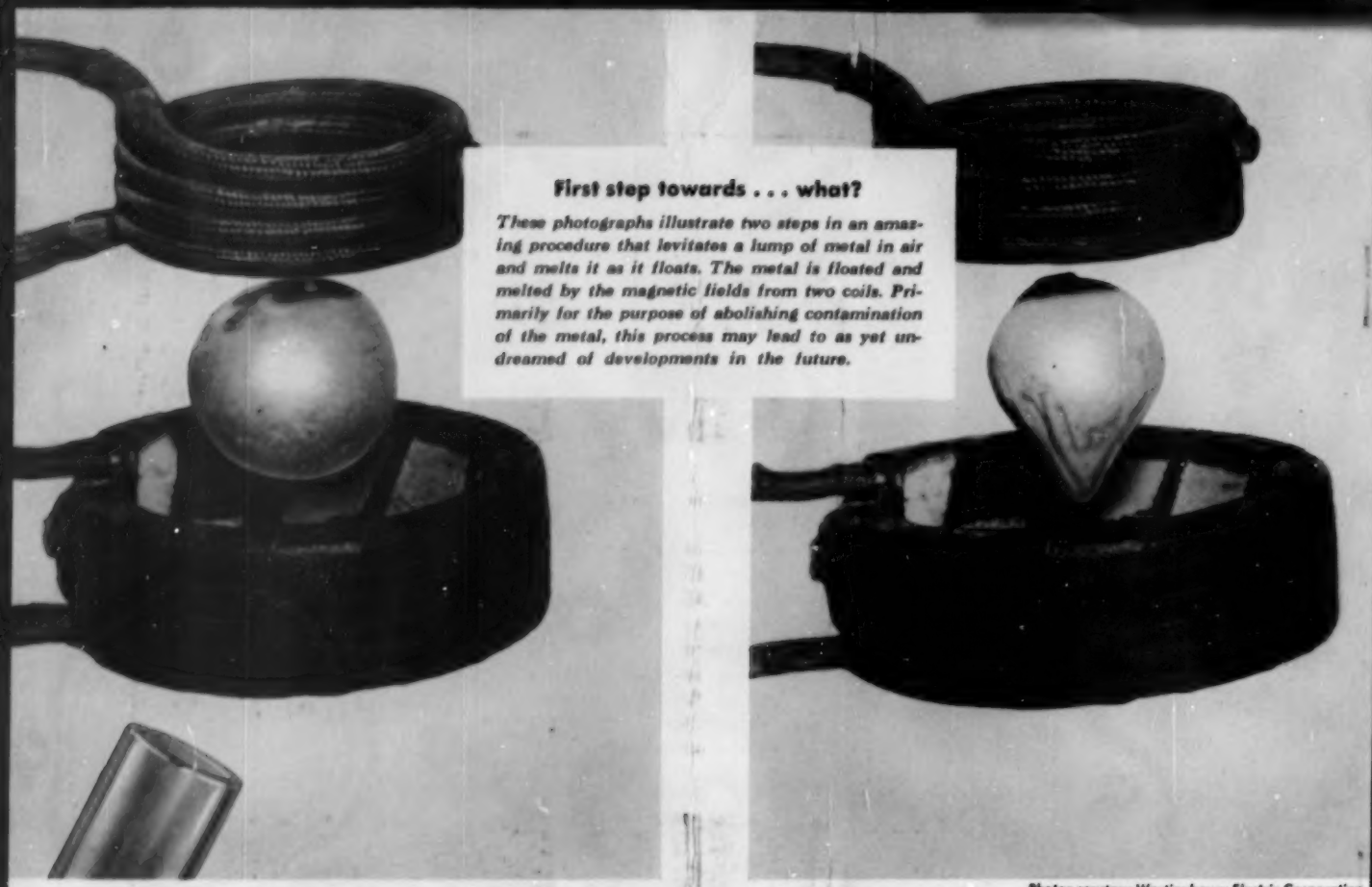
March, 1956 Price $1.00

Industrial Arts and Vocational Education

School Shop Annual



The Shop Teachers' Professional Magazine



First step towards . . . what?

These photographs illustrate two steps in an amazing procedure that levitates a lump of metal in air and melts it as it floats. The metal is floated and melted by the magnetic fields from two coils. Primarily for the purpose of abolishing contamination of the metal, this process may lead to as yet undreamed of developments in the future.

Photos courtesy Westinghouse Electric Corporation

The thrust . . . and the awareness

What the aftermath of an amazing development such as that shown above may be no man can tell. For man's mind works by a process of thrust . . . and awareness. Almost naked will probes the darkness of the unknown like a sword and then man becomes aware of what has been brought to light. This is as true of the penetrating perceptions of ancient Greek philosophy as it is of the achievements of an Einstein, of the great thrusts of science and engineering today.

Since this process is so productive . . . *and only it can be productive* . . . surely more men must be brought to awareness of its very existence. That is the first step past mere egotism and self-absorption into the realm where men see, create and *give*, where may be found the enlightenment which alone can bring peace and amity to the world.

Is this too much to propose to educators as substance for their students? Not at all. It is just a question of in which direction native energy, native ambition, native thought, native action will go. Mechanical drafting teaching for example can be completely "mechanical" or it can be shown for what it is . . . first step in creativeness . . . initial move toward giant career . . . first step linking hand and brain . . . a demonstration to the student that *all* originates from within.

At such a point, whether a student shall economize on the purchase of the tools of this discipline becomes an impertinent question. Shall the minor saving so gained in the purchase of the cheap and shoddy be permitted to vitiate perhaps all the educator is trying to do? We think not.

EUGENE DIETZGEN CO.

Chicago • New York • San Francisco • New Orleans • Los Angeles
Pittsburgh • Washington • Philadelphia • Milwaukee

Dealers in All Principal Cities

DIETZGEN

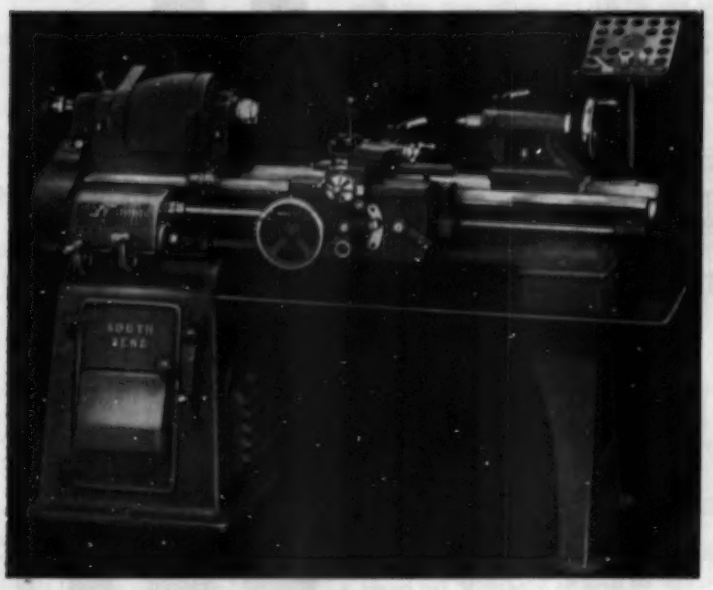
EVERYTHING FOR DRAFTING
SURVEYING AND PRINT-MAKING

Students learn faster on SOUTH BEND

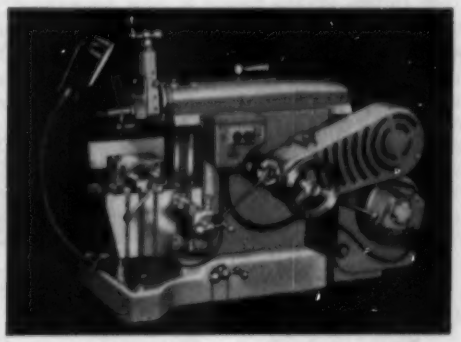
Time is always at a premium in every shop course—there's always more that should be taught than time permits.

Here's where South Bend machine tools help by decreasing the time spent developing machine-handling ability. Their simplicity of design makes them exceedingly easy to operate. All controls are fast and positive in action . . . distinctively shaped knobs are readily recognized by touch . . . large feed dials plainly marked for easy reading. The time saved can be used by the students for developing their skills—they'll learn faster and get more out of the course. Also, this means easier teaching for you as less supervision is required. Send coupon for information on all the advantages of South Bend machine tools.

Pedestal Grinder with 8" wheels but less motor, f.o.b. factory..... **$257**



13" x 5' Toolroom Lathe with toolroom attachments (less electrical equipment) f.o.b. factory..... **$2049**



7" Precision Bench Shaper, less motor, stand and toolholder, f.o.b. factory..... **$551**

Send for Catalog 5600

This new 50th Anniversary Catalog illustrates entire line of South Bend Precision Machine Tools and Accessories. Send for your copy today!

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ ½" & 1" Collet TURRET LATHES ☐ TOOL GRINDERS ☐ 7" BENCH SHAPERS ☐ MILLING MACHINES

Name_____ School _____

City_____ State_____

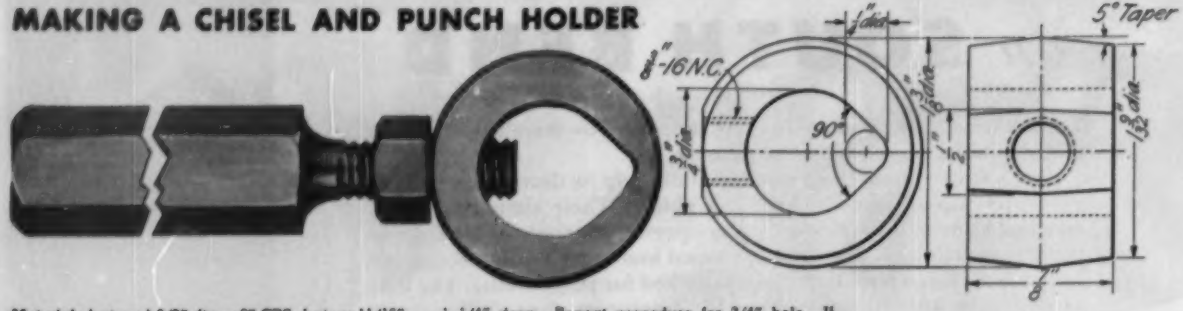
Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

HOW-TO project for the School Shop

—by NICHOLSON FILE COMPANY

NO. 16 OF A SERIES

MAKING A CHISEL AND PUNCH HOLDER

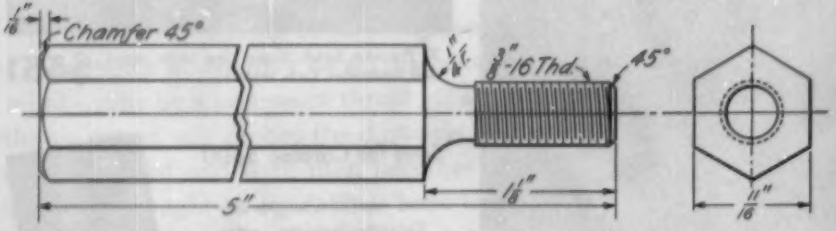


Material: 1 piece 1 3/8" dia. x 2" CRS, 1 piece 11/16" Hex CRS 5 1/8" long, 1 Hex nut 3/8–16.

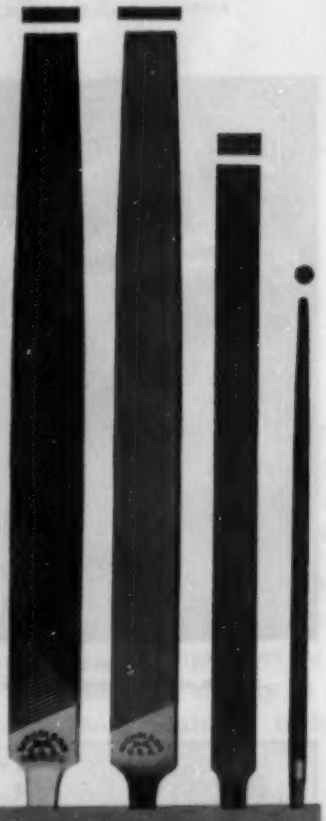
Tools: Layout dope, center square, scriber center-punch, hammer, 6" rule, dividers, universal wiggler, combination drill and countersink, 1/4" and 3/4" drills, hermaphrodite calipers, cutting-off tool, rt.-hand round nosed and rt.-hand side tools, 7/8" counterbore with 5/16" pilot, 3/8–16 N.C. tap and tap wrench, and the following Nicholson files: 10" Flat Bastard, 10" Mill Bastard, 8" Pillar Bastard and 6" Round Bastard or Round Second Cut.

SCHEDULE OF OPERATIONS

Making head. 1. File end of 1 3/8" stock smooth with Nicholson 10" Flat Bastard. Paint with layout dope. 2. Mark line A across end with center square and scriber. 3. With center square scribe center of stock and mark with punch. With dividers at 3/8", set one leg in punch mark and scribe arc on line A as reference mark for 1/4" drill. 4. If holes are drilled in lathe, use 4-jaw independent chuck. Locate 1/4" hole, using universal wiggler to insure alignment. Spot center with combination drill and countersink to guide drill. Drill 1 1/4" deep. Repeat procedure for 3/4" hole. If lathe work is not desired, drill 3/4" hole and file form of eye with 6" Round Bastard and 8" Pillar Bastard files. 5. Turn taper with spindle speed of approx. 200 rpm. Mark off 7/16" from end of work with hermaphrodite calipers. Set compound rest to 5° and turn to 7/16" mark with rt.-hand round nosed tool. Reverse compound setting, touching tool to 7/16" mark, and repeat procedure. Remove tool marks with 10" Mill Bastard file, using long, even strokes for a smooth surface. Cut off to 7/8" with cutting-off tool. 6. With 6" rule and scriber, mark angle touching outside of both holes. Repeat on other side. 7. With work in vise, file to line using 8" Pillar Bastard. Take care to keep edge of file from cutting radii of holes. 8. Scribe line across top of crown, locating from line A. Centerpunch and drill 5/16" tap holes. 9. Hold work in drill vise and spot face with 7/8" counterbore which has 5/16" pilot to remove crown. If counterbore is unavailable, remove crown with 10" Flat Bastard file. 10. Tap with 3/8–16 N.C. tap, checking tap on 2 sides to insure alignment. 11. Draw file sides and top flat of crown with 10" Mill Bastard, using chalk to obtain smooth surface.



Making handle. 1. File ends of Hex stock to remove tool marks. Paint ends with layout dope. Locate center of work with center square and scriber. Mark end centers with punch approx. 1/16" dia., hitting 2 or 3 light taps with hammer. Place work between lathe centers and turn by hand. Reset punch marks if work runs too much out of true. Center to 3/16" dia. using combination drill and countersink between lathe centers. 2. Square one end smooth using rt.-hand side tool and approx. 300 rpm. spindle speed. Set rt.-hand side tool approx. 45° to chamfer end. File chamfer with 8" Mill Bastard for smooth finish. 3. Reverse log and square second end. Lay off 1 1/8". Rough turn to 25/64" in 2 cuts. Finish turn to .370—.375", with tool ground to 1/4" radius. Remove radius tool marks with 6" Round Bastard or Second Cut file. File corners with 8" Mill Bastard. 4. Procedure for cutting 3/8–16 thread is left to instructor. 5. Draw file handle using 10" Mill Bastard and chalk. Take one pass on each corner for finished appearance, easier handling. 6. Check work with instructor. Work can be case or pack hardened.



Left to right are shown the Nicholson 10" Flat Bastard, 10" Mill Bastard, 8" Pillar Bastard and 6" Round Bastard files recommended for this problem. (The alternate 6" Round Second Cut is not shown.) These and hundreds of other sizes and types are readily available in Nicholson or Black Diamond brand through industrial suppliers and hardware dealers.

FREE REPRINTS OF THIS PAGE

for school-shop use will be sent to school heads or instructors on request. Please ask for "How-To Project No. 16," stating minimum number of copies required.

NICHOLSON U.S.A. NICHOLSON FILE COMPANY
Providence, Rhode Island
World's largest manufacturer of A FILE FOR EVERY PURPOSE

MARCH
1956

VOL. 45 NO. 3

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

Published on the 15th of the month preceding the date of issue by THE BRUCE PUBLISHING CO., 400 North Broadway Milwaukee 1, Wis. • CENTRAL OFFICE: 20 North Wacker Drive, Chicago 6, Ill. • EASTERN OFFICE: 225 Broadway, New York 7, N. Y.

★ ★ ★

This Month's Cover

The photograph on the cover of this issue was taken in the machine shop of the Harding High School, Warren, Ohio.

Safety precautions are strongly emphasized in this school.

For your further information, see the article on page 91 on "A Comprehensive High School," prepared by W. K. Dunton, coordinator of vocational education and industrial arts at Warren, Ohio.

The Heart Fund Campaign

The American Heart Association, 44 East 23rd St., New York 10, N. Y., makes a plea for your help in its eighth annual campaign for funds to be used in heart research, professional and public education, and community heart programs. The 1956 Heart Fund campaign, which began February 1, will continue through February 29.

★ ★ ★

Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1956, by The Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

Subscription Information.—Subscription price in the United States, U.S. possessions, and Canada, $3.50 a year, payable in advance. In all foreign countries, $4.00. Single copies 50 cents.

Discontinuance.—Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of non-receipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions.—The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for upon publication. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed.—The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

CONTENTS

Shop Planning

Committee of 300 Plans School Shops.....*J. Lyman Goldsmith* 63
Steps in Planning School shops.....*Paul N. Wenger* 67
Industrial Arts at Alexander Ramsey High School..*Douglas O. DeLano* 68
The Chambersburg Area Senior High School.....*J. Frank Faust* 70
Outline for a Graphic-Arts Laboratory.....*Otis H. Chidester* 75
Wood Shop at Eisenhower Senior High School.....*Mervyn T. Jones* 79
New Vocational-Arts Building at Nebraska State Teachers College
.....*Otto C. Olsen, Kenneth F. Carlson, Warren Messman,* and *Floyd Krubeck* 80
Industrial Arts at the Elk Mound High School
.....*Dwight D. Chinnock* and *Van R. Cartwright* 83
The Morris Township Junior High School.....*James M. Lynch, Jr.* 85
A Florida School Building.....*V. C. Knepper* 87
Industrial Arts Department, Custer High School.....*Roy A. Radtke* 88
A Comprehensive High School.....*W. K. Dunton* 91
A Mechanical Arts Center.....*Samuel C. Beeler* 94
School Shop Building.....*M. D. Hartsook* 96
Masonry Shop in a Comprehensive High School.....*Withro McEnge* 96
Vo-Ag and General Industrial-Arts Shop.....*Grant Herr* 97
Clarence Olson Junior High School.....*Nelson N. Stork* 97
School Plant and Equipment.....*David Peyton* 101

Material Storage and Tool Panels

A Project Storage System.....*Omer K. McCaleb* 93
A Planned Project Storage.....*Neil Helgeland* 105
Tool Board for the Lathe.....*G. A. Sporre* 106
Mobile Accessory Tool Panel.....*James J. Kinsey* 109

Course Outlines

Adding Baking to Industrial Arts.....*Ned Peyton* 98
A Course of Study in Related Physics for Machinists
.....*James A. Parker* 111
A Program in Lithographic Printing.....*Benjamin J. Novak* 116

Miscellaneous

An Easy Cleanup Plan.....*Charles O. Brummer* 104
Student Participation in Grading Projects.....*Michael Jankowski* 108
Do-It-Yourself.....*Kermit A. Seefeld* 114
Home and Shop Repairs With Liquid Plastics and Fiberglas
.....*Alexander F. Bick* 117
Automotive Equipment, Tools, and Supplies
.....*Andrew D. Althouse* and *Others* 26A

Equipment and Supply List

Woodworking 30A
Electricity 38A
Metalworking 44A
Drafting 54A
Print Shop..... 64A
Automotive 70A
Ceramics 78A
Office Machines..... 78A
Refrigeration 80A
Association News..... 4A
Personal News 73A
News Notes..... 77A
New Publications..... 89A
Shop Equipment News..... 92A
Descriptive Materials..... 104A

Association News

COMING CONVENTIONS

Mar. 15–16. California Industrial Education Association, at Kern County Fair Grounds, Bakersfield, Calif. Secretary, Harry D. Bodkin, 131 Moore Hall, UCLA, Los Angeles 24, Calif.

Mar. 15–17. New Jersey Vocational and Arts Association, at Hotel Berkeley-Carteret, Asbury Park, N. J. Secretary, Mrs. Hazel N. DeCamp, 8 Mountain View Place, Irvington 11, N. J.

Mar. 22–24. Ohio Industrial Arts Association, at Neil House, Columbus, Ohio. Secretary, C. R. Hawes, 629 Switzer St., Greenville, Ohio.

Mar. 25–29. American Personnel and Guidance Association, at Shoreham Hotel, Washington, D. C. Secretary, Dr. Arthur A. Hitchcock, 1534 "O" St., N.W., Washington, D. C.

Apr. 3–4. Ontario Industrial Arts Association, at Toronto, Canada.

Apr. 11–12. New York State Steering Committee for Industrial Arts, at New Yorker Hotel, New York, N. Y. Secretary, Richard S. Enders, Cold Spring Road, Baldwinsville, N. Y.

Apr. 12–14. Michigan Industrial Education Society, at Sheraton-Cadillac Hotel, Detroit, Mich. Secretary, Eugene Watkins, 4029 Allen Court, Bay City, Mich.

Apr. 13. Industrial Education Conference, at Memorial Union, Iowa State College, Ames, Iowa. President, Lowell L. Carver, 101 Industrial Arts Building, Iowa State College, Ames, Iowa.

Apr. 21. Utah Industrial Arts Association, at Wasatch School, Provo, Utah. Secretary, Jay L. Nielson, Farrer Junior High School, Provo, Utah.

Apr. 24–27. American Industrial Arts Association, at the Hotel Schroeder, Milwaukee, Wis. Local chairman, Roy A. Radtke, 1111 North Tenth St., Milwaukee, Wis.

May 3–5. Wisconsin Association for Vocational and Adult Education, at Loraine Hotel, Madison, Wis. Secretary, C. D. Rejahl, 211 N. Carroll St., Madison, Wis.

May 12. Virginia Council of Industrial Clubs, at Hotel Roanoke, Roanoke, Va. Secretary, O. F. Haynes, Petersburg High School, Petersburg, Va.

MILWAUKEE PLANS 1956 AIAA CONVENTION

More than 800 industrial-arts supervisors, teachers, and teacher educators are expected at the 19th annual convention of the American Industrial Arts Association to be held in Milwaukee, April 24–27, at the Hotel Schroeder.

Roy A. Radtke, supervisor of industrial arts for Milwaukee public schools, and vice-president of the AIAA, has announced high lights of the program which include several features designed to attract industrial-arts educators. There will be an outstanding "history of tools" exhibit, developed by the Wilkie Foundation; a special showing of student shop projects from six midwest states; a teachers' craftwork exhibit that will give instructors a chance to exhibit their finest projects, and a student teacher demonstration illustrating new techniques for giving class demonstrations.

The four-day convention will open Tuesday, April 24, with separate meetings of the teacher-training and supervisor groups.

Presentation of the new yearbook, and the "man of the year" award in education will be made at a noon luncheon Tuesday. Incoming officers of the association will be introduced following the presentation of the award.

General sessions and some special-group sessions will be held in the Milwaukee Auditorium nearby.

Harold S. Vincent, Superintendent of Milwaukee Public Schools, will address the conventioneers at the annual banquet Friday, 6:30 p.m., at the hotel. A "ship's party" will follow the banquet in the Schroeder's Crystal Ballroom.

Schools in the Milwaukee area are setting up an exhibit of student work from the seventh through the twelfth grade. The Ford Motor Company will sponsor a special display of the 68 award-winning projects from Wisconsin, Minnesota, Iowa, Michigan, Illinois, and Indiana.

Student teachers from 12 midwest colleges will present a series of demonstrations in industrial-arts subjects. This series will illustrate some new techniques for giving class demonstrations, as well as new processes.

The DoAll Company's exhibit, "Civilization Through Tools," prepared by the Wilkie Foundation, is an accurate historical tracing of man's progress over the past million years. Ten large panels will show the evolution of tools from the stone age to modern times.

The special exhibit for teacher's craft articles is open to all teachers from junior high school through college. Projects will be housed in a

(Continued on page 6A)

SHELDON
CHICAGO U.S.A.

SHELDON MACHINE CO., INC.
4246 North Knox Ave., Chicago 41, Ill.
Gentlemen: Please add my name to your Shop Instructors mailing list:
Name ..... ☐ School ☐ Home
School .....
Street Address ..... Zone ..... State .....
City .....
PLEASE SEND ME YOUR NEW CATALOGS DESCRIBING
☐ 10" ☐ 11" ☐ 13" Sheldon Lathes
☐ 12" ☐ 15" Sebastian Geared Head Lathes
☐ Horizontal Milling Machine ☐ 12" Shaper

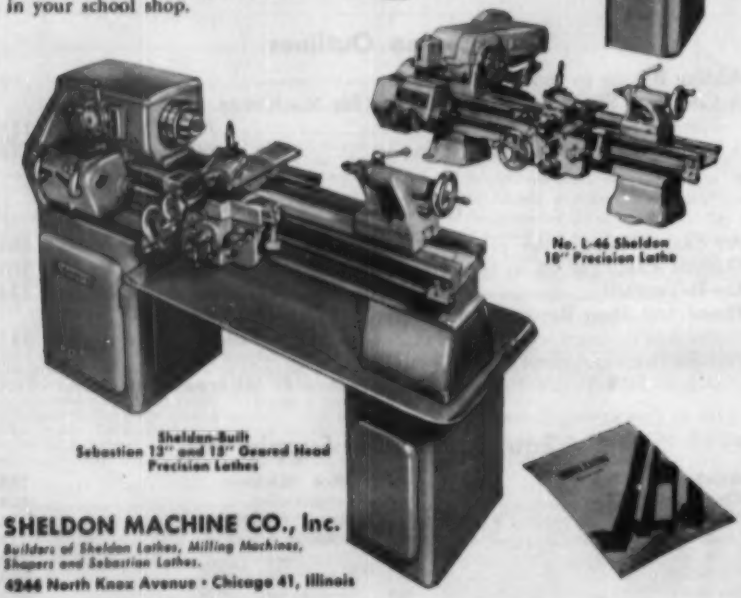
Better Machine Tools for Teaching
. . . safer to operate, easy to learn on

For every school shop, laboratory and classroom . . . (from beginning classes in industrial arts and vocational education through advanced courses in trade schools and universities) . . . Sheldon builds a lathe to fit each academic, space and budget requirement.

Sheldon lathes are modern in design. With their easy-to-operate controls, students can learn basic lathe operations quickly and rapidly advance to practical shop projects.

From the largest 15" swing geared head lathe to the smallest 10" swing bench lathe, every Sheldon-built lathe meets the same rigid standards . . . standards that insure long life with minimum maintenance requirements in your school shop.

UM-56 P
13"-Swing
Precision Lathe



No. L-46 Sheldon
10" Precision Lathe

Sheldon-Built
Sebastian 13" and 15" Geared Head
Precision Lathes

SHELDON MACHINE CO., Inc.
Builders of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes.
4246 North Knox Avenue • Chicago 41, Illinois

Starrett TOOLS

• PRECISION MEASURING TOOLS

New catalog No. 27 shows a complete line of Starrett Tools priced to fit school budgets. Write for your free copy.

• STEEL TAPES AND STEEL RULES

Quick-reading steel tapes and no-glare *Satin-Chrome* steel rules pioneered by Starrett for fast accurate measuring

• SETS OF TOOLS

The essential measuring tools needed for modern shop projects . . . in compact, convenient kits — easy to issue, carry and store.

• HACKSAWS, BAND SAWS, HOLE SAWS

Power and hand hacksaw blades; band saws and hole saws for cutting metal, wood, plastics . . . precision made by Starrett to cut faster, last longer.

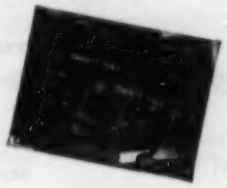
Starrett EDUCATIONAL AIDS

• BOOK FOR STUDENT MACHINISTS

An authoritative handbook on tools, machines and modern shop methods. Written in clear, simple shop language. Profusely illustrated, completely indexed. $1.25 per copy.

• STUDENT NOTEBOOK PAGES

Fifteen blueprint-type tool charts available in wall size for instructors (free) and in notebook size for students (25 cents per set).



• 16MM SOUND MOVIE

Precision measuring from basic rules to latest precision methods in 30 interest-packed minutes. Loaned without change to vocational schools. Arrange for a free showing.

• OTHER EDUCATIONAL AIDS

Wall charts, "How to Read" booklets, informative folders, catalogs, ready reference cards and calculators . . . available free for your classes. Write for new Training Aids Bulletin No. 1202.

Address Dept. CE

Buy through your industrial distributor — Prompt delivery, Dependable service, Quality products

BUY THROUGH YOUR DISTRIBUTOR

Starrett®

"WORLD'S GREATEST TOOLMAKERS"

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS • DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK • HACKSAWS, BAND SAWS and BAND KNIVES
THE L. S. STARRETT COMPANY, ATHOL, MASSACHUSETTS, U. S. A.

ASSOCIATION NEWS

(Continued from page 4A)

special exhibit hall. The hall will be carefully supervised during the day and patroled at night. Exhibitors may contact: Alex Bick, Hartford Avenue School, 2227 East Hartford Avenue, Milwaukee 11, Wis., stating nature and number of projects they wish to submit for display.

The Milwaukee Local Arrangements committee, under Mr. Radtke's direction, has nearly completed both the professional program and the plans for housing and entertainment of conventioneers. Trips to Milwaukee industry and city and suburban schools are planned. A high point of the schools tour will be the new Custer High School completed last fall at a cost of more than $4,500,000. It houses six shops and two mechanical drawing rooms.

IDAHO INDUSTRIAL ARTS ASSOCIATION

During the past year, on April 15, 1955, a group of interested industrial arts teachers assembled in Boise, Idaho, in the School Administration Building for the purpose of organizing an official State Industrial Arts Association composed of industrial arts teachers teaching in the state of Idaho.

During the business of the meeting state officers were elected by the group present. They are: Paul Blair, Boise, president; and Irving L. Stiber, Caldwell, secretary-treasurer.

The building of the constitution and bylaws was placed in the hands of a special committee.

The charter members present at the first meeting are: Chester Caldwell, Sidney Miller, Robert Eyestone, Elwood L. Evert, Asael E. Bell, Joe Quinley, John Findlay, George A. Reed, Paul O. Blair, Thomas W. Matthew, Keith Byerley, John Rupert, and Irving L. Stiber. George Radcliffe was elected an honorary member. — *Irving L. Stiber, secretary.*

INTERNATIONAL GRAPHIC ARTS EDUCATION ASSOCIATION

The new officers of IGAEA for 1955–56 are: Otis H. Chidester, president; Charles E. Kennedy, vice-president; Harold C. Hill, secretary; and Vincent C. Coyne, treasurer.

In making plans for the coming year, this group of officers will do their utmost to help assure the continuing growth and increasing services of the International Graphic Arts Education Association.

CHI CHAPTER OF IOTA LAMBDA SIGMA INSTALLED AT TEXAS A. & M.

The climax of several years of work was reached at Texas A. & M. College May 19, 1955, with the installation of Chi Chapter of Iota Lambda Sigma. This is the first resident chapter of this fraternity in Texas. The installation ceremonies were held in the Memorial Student Center with Glenn Smith, a member of Zeta Chapter of Oklahoma A. & M. College, and past president of Grand Chapter of Iota Lambda Sigma, as installing officer. Dr. David H. Morgan, president of Texas A. & M. College, was made the chapter's first honorary member.

Fraternity members who assisted Mr. Smith with the installation were Chris Groneman, Alpha Chapter, Pennsylvania State University; Harold D. Bearden, Mark Lowrey, Frank J. Konecny, Sigma Chapter, University of Texas; Thaine D. McCormick and Leslie V. Hawkins, Zeta Chapter, Oklahoma A. & M. College.

Officers elected for the forthcoming year are as follows: William L. Powell, president; Carl C. Livesay, vice-president; Dennis M. Heitkamp, secretary-treasurer; Leslie V. Hawkins, faculty adviser.

Charter members of the organization are: Glenn E. Baker, Ernest F. Biehunko, Tom P. Birkhead, James L. Boone, Earl B. Boykin, Thomas W. Bradley, Gerald Brink, Lawrence E. Brockman, Jr., Glen R. Connally, Alfred M. Cook, Jr., Joe F. Dillard, Curtis L. Flourney, Rex Hall, Bryce L. Hardeman, Dennis M. Heitkamp, Alton J. Hendrick, John E. Huff, Lawrence A. Ingram, Jerry D. Johnson, Donald L. Jones, Samuel W. Kiker, Jeff B. Lilley, Jr., Carl C. Livesay, Jack E. Luker, Frank A. Malek, Frank D. Nixson, Donald E. Noble, William L. Powell, Hardy B. Purvis, Jr., Philip G. Sanders, Archie Stallings, Jr., Don M. Viquet, Oscar R. Whiteside, James R. Witte.

Members of the industrial education staff who joined as charter members were James L. Boone, Rex Hall, Bryce L. Hardeman, and Frank D. Nixson. — *Leslie V. Hawkins.*

NORTH CAROLINA INDUSTRIAL ARTS ASSOCIATION ANNUAL MEETING

The North Carolina Industrial Arts Association held its seventh annual fall meeting in Hickory Junior High School, Hickory, N. C., Saturday, November 5.

The theme of the meeting was "Getting Started in Electricity" in 7th, 8th, and 9th grades. Covered by five speakers were: "New Developments in Wiring School Shops and Machines," "Equipment and Supplies," "Successful Practices in Electricity," "Getting Started in Electricity," and "Project Ideas."

(Continued on page 72A)

from its big ball-bearing spindle . . . .
. . . . to the precision carriage . . . .
along its rugged, accurate bed . . . .
to the tailstock . .
. . . . and down to the variable speed drive . . .
and its solid, strong, convenient cabinet
. . . . the No. 6560 Logan 14" Lathe is ruggedly proportioned, precision built and dynamically balanced. Its superiority is evident as it hogs the heavy cuts with almost no perceptible vibration, and produces precision results. Trains the student on an industrial lathe. At your Logan dealer's. Write for Bulletin 14-L.
SPECIFICATIONS AND FEATURES
14⅝" swing over bed
9" swing over saddle
1⅜" spindle hole
1" collet capacity
40" between centers
Variable Speed Drive
Ball Bearing Spindle
38 to 1200 rpm
LOGAN ENGINEERING CO.
4901 WEST LAWRENCE AVENUE • CHICAGO 30, ILLINOIS

W-T WALKER-TURNER

Skills learned today on "Light-Heavyweights" will stand by your students later

Your students will learn more from this machine — it's one they'll find later in industry . . . . . .

Walker-Turner "Light-Heavyweight" 1300 Series 15" Drill Press — with full 6" spindle travel

Working features that make your teaching more effective . . . . . .

1. Unusually big capacity in this light machine — *full 6" spindle travel.*
2. Drills holes in diameters from #60 to ½", up to 6" deep, at a single pass of the drill.
3. Depth indicator, micrometer-type depth stop and vernier movement encourage extremely precise work.
4. Four speeds — 600 to 5000 rpm with standard pulley; 480 to 2900 with slow-speed pulley.
5. BIG machine performance — priced well within your department's budget.

Safety features . . . . . . Stamped steel belt guard provides complete belt and pulley coverage, allows easy access to belt for changes. Quick release motor base makes speed changes easy.

FREE new Specification Guide for schools

This new W-T guide is packed with information you'll want when planning purchases of new machines. Write for it today. We'll include W-T *free* teaching aids, catalog, and name of your nearest W-T Distributor.

walker-turner

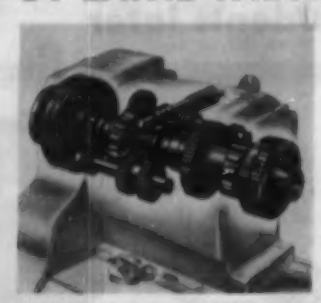
WALKER-TURNER
Division
Kearney and Trecker Corporation • Plainfield, N. J.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT
RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS
RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS
JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

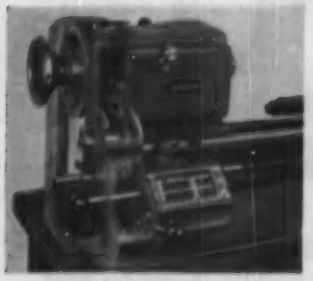
CLAUSING LATHES

YOUR CHECK LIST OF LATHE VALUE

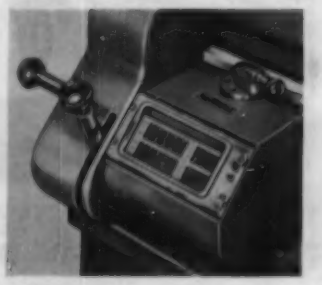
☑ Is headstock fully enclosed with gears traveling in oil bath?



☑ Does spindle turn on widely spaced "Zero-Precision" Timken tapered roller bearings?

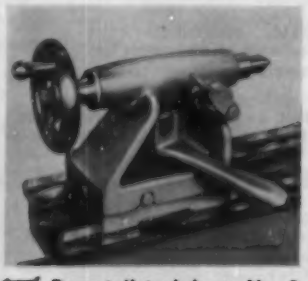


☑ Does it have fully enclosed dual-belt outboard drive with quick, easy belt replacement?



☑ Is Quick-Change box fully enclosed with gears and shafts running in bath of oil?

☑ Is automatic apron fully enclosed with entire mechanism running in sealed oil bath?



☑ Does tailstock have No. 3 M.T. ram with tang socket and permanently attached swing type wrench?

for *Safety*
Convenience
Precision
Performance

Why is the new CLAUSING 6300 Series 12" precision lathe the most practical and desirable for both teacher and student?

Because the CLAUSING excels in safety . . . gives you more safety features than any other lathe of comparable size and price. Headstock, outboard drive, quick change gear box, and double walled apron are all fully enclosed. There are no exposed belts or gears to catch fingers or clothing. Spindle is tapered key-locked type . . . can be reversed or braked without danger of chuck's or face plate's coming off.

CLAUSING sets the standard for convenience. You can change spindle-drive belts without having to remove the spindle . . . change spindle speeds without having to shift belts.

What's more each CLAUSING lathe must meet exacting tolerance limits before it leaves the factory. Individual test reports covering important precision tolerance limits will gladly be supplied upon request. Superior performance is assured!

Feature by feature comparison of basic design and construction superiorities will quickly show you why the CLAUSING 6300 sets the standards for safety, precision, convenience and performance.

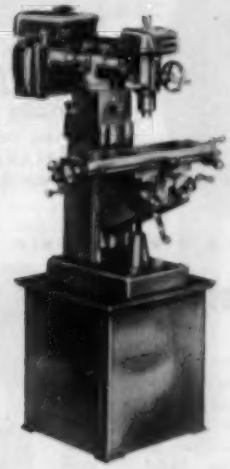
See the new CLAUSING at your nearest Atlas-CLAUSING dealer's before you decide on *any* lathe. Write for catalog TODAY!

Atlas-CLAUSING PRECISION MACHINE TOOLS — DIVISION ATLAS PRESS COMPANY

the PLUS VALUE LINE

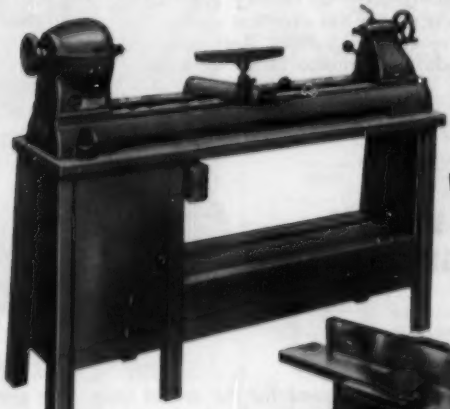
SET THE STANDARDS

CLAUSING 6300 LATHE
1" Collet Capacity — 12" Swing



VERTICAL MILLERS

DRILL PRESSES



Atlas. CLAUSING WOOD LATHE

PLUS VALUE MACHINES for EVERY SCHOOL NEED

In both metal and wood working Atlas-CLAUSING precision machines meet school needs best. They set the standard for safety! And each machine has exclusive operating features that enable students to learn faster . . . with less supervision.

Atlas-CLAUSING machines are ruggedly built to stand up under the punishment of inexpert student use year after year! Their fine quality construction assures you accurate, trouble-free service. They are the easiest operating of all wood and metal working machines.

And equally important to you, they are moderately priced to enable you to buy more equipment per dollar invested . . . to give more students the opportunity to get adequate operational experience.

Before you make your next recommendation or requisition for new power tools make sure you have the latest Atlas-CLAUSING catalogs. Or, see your Atlas-CLAUSING dealer. He will gladly show you why more and more vocational leaders are specifying Atlas-CLAUSING tools.

NEW CABINET STANDS for WOODWORKING MACHINES

New stands that set new standards for stability, convenience and safety . . . completely enclosed pulleys and belts . . . rigidity of 3/16" steel plate . . . stability of pyramid design. Write for full information.

Atlas. CLAUSING JOINTER-PLANER

SEE US AT THE

A. I. A. A. SHOW in MILWAUKEE

CLAUSING DIVISION

Atlas. Press. Company
Quality Machine Tools Since 1911
3-121 N. Pitcher St. • KALAMAZOO, MICH.

STANLEY SHOP TALK

CATALOG No. 34

This STANLEY TOOL CATALOG with the special school index is a particularly useful book of reference and tool information for the shop teacher.

Packed with descriptive facts and hundreds of illustrations, it makes tool selection sure and easy. The handy school index recommends items found most useful and serviceable for school use. It is based upon Stanley's long experience and the advice of educators.

Use the coupon to send for your free copy of the STANLEY TOOL CATALOG with special school index. We will include a 9-page list entitled, *"Suggested Specifications for Equipping a General Shop."*

WOOD CHISELS

Stanley Nos. 40 and 50 — Sturdy "Boy-Proof" Tools for trouble-free performance in school shops. One-piece alloy steel blade and shank extend almost through the handle. Tough plastic handle assembled to blade — will not come loose. Steel cap on handle transmits hammer blow directly to cutting edge of blade. Blade has excellent and uniform cutting qualities. Both chisels made in complete range of sizes.

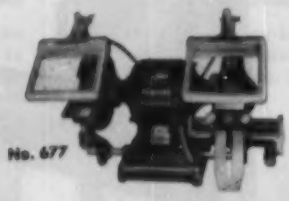
No. 40 No. 50

"YANKEE" PUSH DRILL

The Yankee "100 PLUS" No. 41 — The mechanic's friend, this sturdy all metal tool is a handy shop tool. Bores small holes quickly with a one-hand drilling action. The drill point in use is locked in. Eight drills from 1/16" to 13/64" (by 64ths) are stored in the handle.

No. 41

BENCH GRINDER



No. 677

Especially designed for the school shop. The grinding attachment is for all chisels and plane irons up to 2⅛" wide. Equipped with "Flud-Lite" Eye Shields that cannot be moved to non-guarding position.

ROUTER

A versatile woodworking tool. Shaped edges, inlays, templet cuts. Many woodworking joints are fascinating and easy with the router. ¾ hp motor.

No. R8A

ROUTER MANUAL

Order *"The Router — What It Is and Does."* 38 pages of information with more than 100 illustrations. Only 35¢ to schools.

Use this coupon for more detailed information and school shop help

STANLEY

Educational Dept., Stanley Tools, 473 Elm St., New Britain, Conn.

FREE ( ) Please send me Stanley Tool Catalog No. 34.
FREE ( ) Please send me the Stanley Electric Tool Catalog.
FREE ( ) Please send me "Yankee" Tool Book Y41.
Please send me ..... Router Books at 35¢ ea., postpaid

NAME .....

SUBJECT YOU TEACH or POSITION .....

SCHOOL ADDRESS .....

CITY ..... ZONE ..... STATE .....

Black & Decker® HEAVY-DUTY SAWS are POWER-BUILT to last!

We don't buy motors – we build them!

The *heart* of your electric tool is the motor—completely built by Black & Decker. All the power you need and then some . . . because each motor is built for a specific tool and the job it must do. B&D motors always *stand up!*

NEW B&D SAW TABLE!

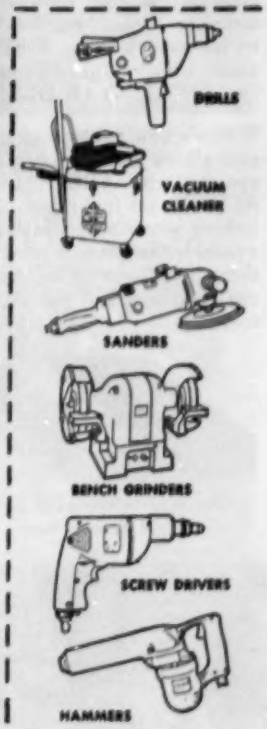
Converts B&D Saws to tilt arbor saws with complete saw table operation. Larger work surface than on many costlier models. Exclusive sawdust deflection; knee-action safety switch; rip fence; mitre gauge. Solid all-steel construction.

NEW 6½" Saw races through 2x4's . . . even at a 45° angle!

Black & Decker offers *the complete* HEAVY-DUTY saw line—built for power, speed and accuracy to help your students do jobs faster, easier, better.

This new B&D 6½" Heavy-Duty Saw (shown above) makes all cuts in 2 x 10's and smaller lumber, cuts 2 x 4's at a 45° angle *with blade to spare!* And all B&D Saws —6", 6½", 7", 8" and 9" models—handle practically any material: ferrous and non-ferrous metals, corrugated sheets, ceramics, tile, slate, transite. Latest safety features—telescoping guard, larger lift-lever, instant-release trigger switch. Latest *convenience* features—calibrated quadrant, larger wing nuts, for faster, easier depth and bevel adjustments . . . clear-view operation . . . easier cutting from right or left side! And every B&D Saw is powered by a B&D-built motor—is *power-built* for years of satisfactory, efficient service!

See your B&D distributor or write: The Black & Decker Mfg. Co., Dept. 2103, Towson 4, Maryland.



Service... one of 42 Black & Decker factory service branches is located "next door" to you. Staffed by experts to give you fast, efficient service and genuine replacement parts.

LOOK IN THE YELLOW PAGES UNDER "TOOLS-ELECTRIC"

Black & Decker®
PORTABLE ELECTRIC TOOLS

WILTON'S RESEARCH PAYS OFF!

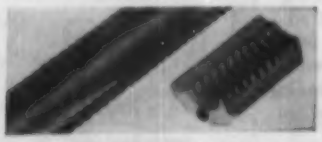
NO MORE REPLACEMENT PROBLEMS WITH WILTON'S NEW *RAPID TITAN*® VISE!

The heart of the story

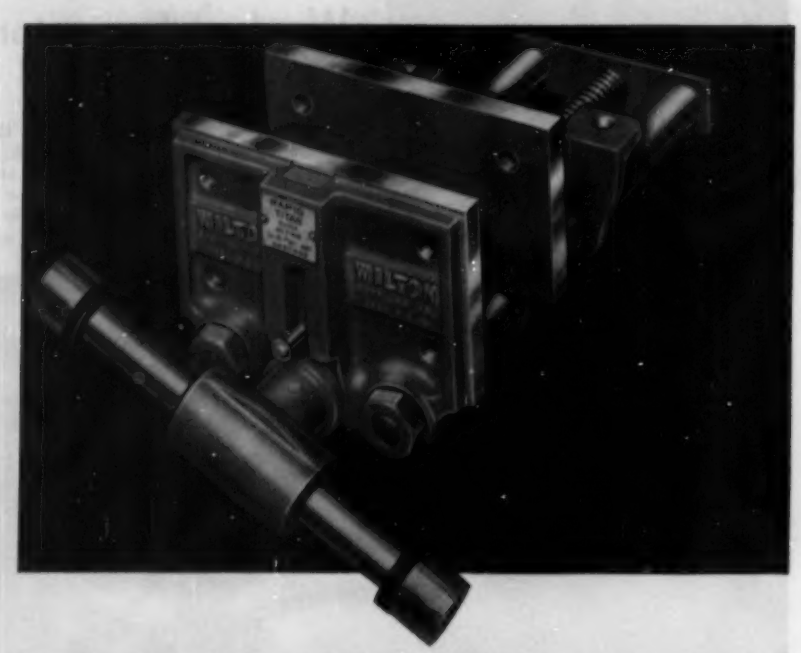
WILTON'S patented, **indestructible** rapid action **nut!**

Wilton's Rapid Titan Nut—made of steel and used with a continuous screw—far outwears the ordinary bronze nut used with an intercepted screw. Even under abuse, the Rapid Titan Nut DOES NOT WEAR OUT!

Wilton's new concept of nut design allows Rapid Titan Vises to operate with FREE SLIDING ACTION, yet fool-proof positive locking screw action is instantly available. And here is good news: *there is no limit to take-up;* you can tighten a full revolution or more!



Obsolete Intercepted Screw and Bronze Nut



Get the fine features of Wilton Vises with no premium in price!

- Sturdier construction—up to 7 lbs. heavier than competitive equivalents
- Solid aluminum handles at the price of wood or steel
- Heavy duty machined steel back plate
- Close machining throughout—fits standard 2¼" bench top
- Unconditional 3-year guarantee

Available in 16 Models — both continuous screw and rapid acting

WILTON TOOL MFG. CO., INC.

SCHILLER PARK, ILLINOIS

Manufacturers of the world's broadest line of vises and clamps

Wilton Machinists' Vises

Wilton C-Clamps

Automatic Machine Vises

Look What You Can Do

on CINCINNATI No.1 CUTTER AND TOOL GRINDERS

Yes, you can demonstrate and your students can perform an exceptionally wide variety of setups on CINCINNATI® No. 1 Cutter and Tool Grinders. These machines are built to industrial standards of ruggedness, accuracy of performance, and freedom from maintenance. Students will grasp the idea quickly; they'll appreciate the safety and ease of operation of the CINCINNATI. Why not get complete information? Ask for catalog No. M-1852.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI No. 1 Cutter and Tool Grinder. Catalog M-1852

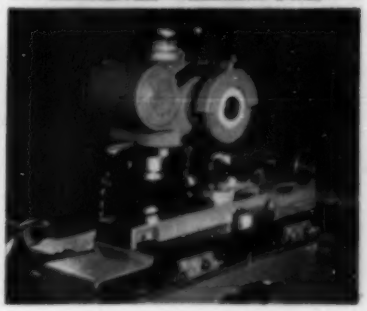
*Surface Grinding Attachment. Extra equipment. †Cylindrical Grinding Attachment required. Work is ground dry.

Grind lathe and planer tools*

Sharpen shell end mill cutters

Sharpen stagger tooth cutters

Cylindrical grind diameters†



Grind flat surfaces*

CINCINNATI

COLUMBIAN VISES are preferred by schools... EVERYWHERE!

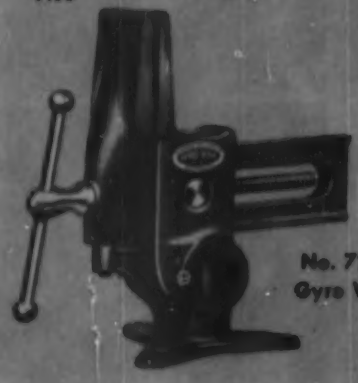
Dependability, ease of operation, long life —these are only a few of the many reasons why more Columbian Vises are used in school shops than any other make.

By training your students on Columbian Vises today, you prepare them well for essential production jobs in industry—on which they will use Columbians tomorrow. A-5022

No. 5C
Continuous Screw
Woodworkers' Vise

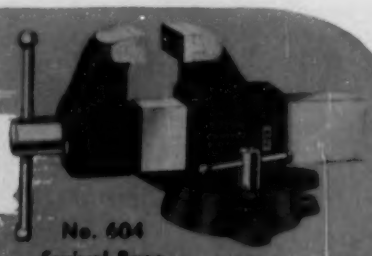
No. 5CD-S
Continuous Screw
Adjustable
Steel Handle

No. 6CD
"Woodcraft"
Vise



No. 72½
Gyro Vise

there is a
COLUMBIAN VISE
for every need
and purpose—



No. 604
Swivel Base
Machinists' Vise

No. D-43½
Home Workshop
Vise

No. 504
Stationary Base
Machinists' Vise

COLUMBIAN
Vises
The Columbian Vise & Mfg. Co.
CLEVELAND 4, OHIO

Also manufacturers of Columbian Levels

YATES-AMERICAN J-LINE WOODWORKING MACHINES

Complete line of machines and accessories, for a wide range of operations and projects — in wood, plastics, light metals.

20" Band Saw

12" Lathe

18" x 6" Surfacer

8" Jointer

16" Disk Sander

Belt-Disk Sander

Shaper

Mortiser

looks like his requisition's been approved! He must have specified Yates-American J-line Machines. More and more woodworking instructors are. And we could write reams and reams of words to tell you why. We could expound on J-line safety . . . on economy of purchase and operation . . . on construction that shrugs off student abuse . . . on working height that's especially convenient . . . on the confidence you feel in dealing with a company that has specialized in woodworking machines since 1883. But we think you'd rather see for yourself. Your local Yates-American dealer welcomes your inspection. Tear out and mail the coupon below today for his name — and for J-line bulletin.

Yates-American BELOIT, WISCONSIN

BRANCH OFFICES: CHICAGO, ILL., HIGH POINT, N.C., MEMPHIS, TENN., PORTLAND, ORE.

BRAND NEW! Saw-Jointer-Sander Combination

A completely new design concept—safer, easier to use. 8" Tilting-Arbor Saw — 4" Jointer — 10" Disk Sander.

Tear out coupon and mail today!

YATES-AMERICAN Dept. C, 721 N. Fourth St., Beloit, Wisconsin

Send me the name of my Yates-American J-line distributor — also latest bulletin.

Name.....

Position.....

School.....

Address.....

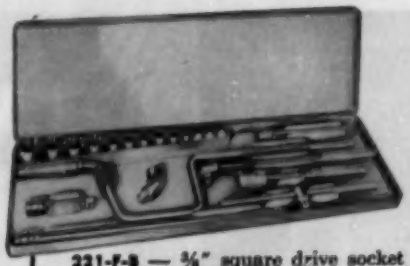
City..... Zone..... State.....

Snap-on*

CAREER TOOLS

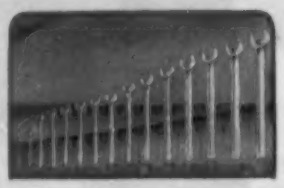
for school shop training

Train your students with *Snap-on* tools and give them the full benefit of shop instruction. Send them to their first jobs with a full knowledge of the tools used by most top-flight mechanics.

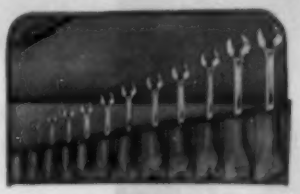


221-F-8 — ⅜" square drive socket wrench set — 21 matched units for tight places, hard-to-reach nuts. Many other sets available.

XV-611-K — 11 offset Boxocket® wrenches from ⅜" to 1¼". Knuckle-saving clearance, powerful leverage.

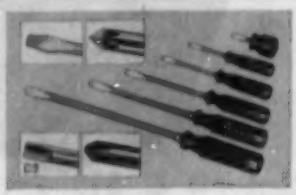


OEX-715-K — 15 Combination wrenches from 5/16" to 1¼". Combines safe Boxocket® leverage and open end nut-turning speed.



OE-812-K — 12 Open-End wrenches from ¼" to 1⅛". Covers practically every nut-turning job in automotive and tractor repair.

LTA-808-K — 4 pairs of wrenches for every tappet job. Sizes 7/16" to ⅞". Thin heads and long handles provide both speed and safety.

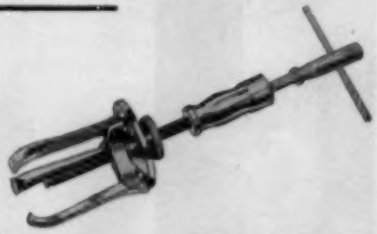


SNAP-ON SCREW DRIVERS — sizes and blade tips for every job. Shock-proof handles, tough well-anchored blades.

SNAP-ON PLIERS — built to last longer and work better. Grippers, cutters, needle-nose and specials.

SCP-160-K — set of 16 chisels and punches. Gives you the right size and type for practically every job.

MT-315-8 — motor tune-up set with 15 units to tell young mechanics what's wrong with a motor.



CG-273-H — 3-jaw medium size slide hammer puller for safe, uniform pulling of wheels, gears, etc.

TORQOMETER WRENCHES—25 models, 0-30 in. lb to 0-4000 ft lb tell specified tensions as easy as telling time.

Detailed information and illustrations of all *Snap-on* tools are included in catalog V. Write for your copy listing over 4,000 quality tools for school shop training.

SNAP-ON TOOLS CORPORATION

8074-C 28th Avenue • Kenosha, Wisconsin

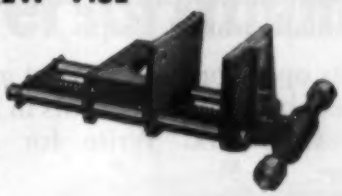
*Snap-on is the trademark of Snap-on Tools Corporation.

Whatever Your School Shop Need Morgan Has a Vise to Meet Your Requirements

For Woodworking

SOLID NUT CONTINUOUS SCREW VISE

Designed and built to withstand the most severe service. Simplicity of construction insures trouble-free operation. Features extra heavy Cold Rolled Screw and solid nut for long life. Interchangeable cold rolled side bars are threaded and held in place by hexagon nuts — not riveted. With stop in front jaw.

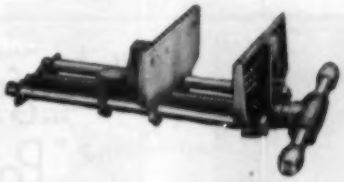


JUNIOR WOODWORKERS VISE

Solid Nut Continuous Screw woodworking vise with stop in front jaw. Made of semi-steel castings, fully machined. Hardwood handle. Same fine quality as in all Morgan vises.

QUICK ACTION VISE

Most simple and effective of the screw adjusting type vises. Intercepted threads on the screw operate in a half nut. Offers speedy gripping power. High qaulity bronze half nut. Carefully machined working parts.

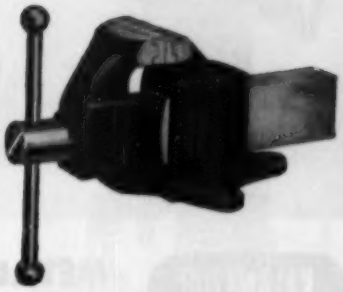


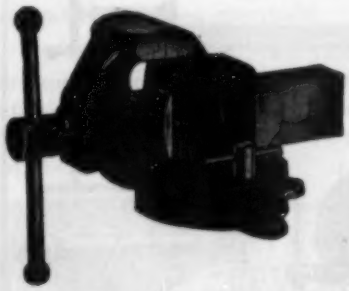
For Metalworking

MACHINISTS' BENCH VISE

Solid Jaw and Stationary Base

Special semi-steel casting. Sliding bar's accurate milling means a snug fit of the broached base opening. The solid steel forged screw engages in a malleable iron acme threaded nut. A lifetime, rigid-gripping vise.





MACHINISTS' BENCH VISE

Solid Jaw and Swivel Base

May be rotated 360° and clamped in any desired position. A specially designed nut locks the base. No play despite heavy duty. Unusual rigidity and strength for a swivel base vise.

Write today for our free catalog.

Morgan Vises are unconditionally guaranteed. Finest quality in materials and workmanship assure you of long lasting, dependable vises which means long-run replacement savings.

MORGAN VISE CO. 120 N. Jefferson Street, Chicago 6, Illinois

FOR THE MODERN SCHOOL SHOP

NO. 10 HOLLOW CHISEL MORTISER

The POWERMATIC No. 10 is fast becoming the most popular Hollow Chisel Mortiser in the Modern School Shop. The "MAGIC" action of the sliding head forever banishes the sticking, jumping and pounding common in most hollow chisel Mortisers.

Extremely heavy in construction and designed for production work; this precision made machine is priced well within the budget of the School and small cabinet shop.

The compound table permits operator to mortise at any angle, while the rack on the table enables successive cuts in a straight line without unclamping the work. Write for complete information.

PRICED COMPLETE with 1 HP motor $515.00

Also Manufacturers of 12", 16", 20" & 24" Planers, Chain Saw Mortisers and Single End Tenoners.

MANUFACTURED BY

POWERMATIC MACHINE COMPANY • McMinnville, Tenn.

KALAMAZOO

METAL CUTTING BAND SAW

MODEL 8C
CUTS 8" ROUND, 16" FLAT STOCK. 8" PIPE

Good tools make teaching good workmanship easier. That's why most leading schools use *Kalamazoo* Metal Cutting Band Saws. Specify *Kalamazoo* for accuracy and safety. Four models, available with casters and coolant. Get full details *now*.

SEE US AT BOOTH 639, A.S.T.E. SHOW IN CHICAGO
MACHINE TOOL DIVISION

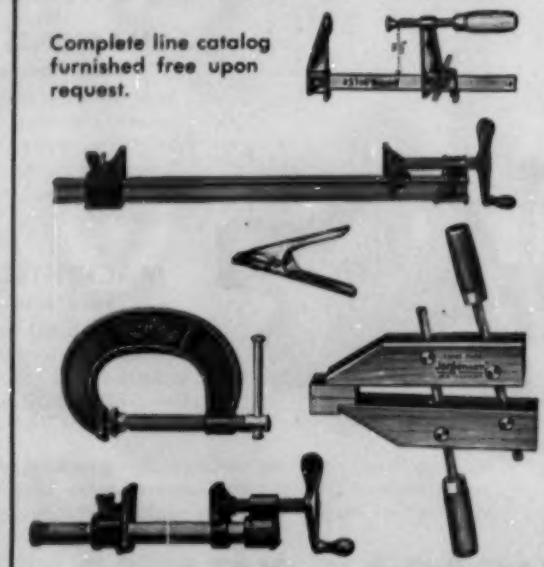
Kalamazoo TANK and SILO CO.

319 HARRISON ST., KALAMAZOO, MICHIGAN

"Jorgensen" TRADE MARK REG U.S. PAT. OFF. and "Pony" REG. U.S. PAT. OFF. / CLAMPS

favorite in the SCHOOL SHOP for over 50 years

Complete line catalog furnished free upon request.



the clamp folks / ADJUSTABLE CLAMP CO.
424 N. Ashland Ave., Chicago 22, Ill.

For Vocational Training...

NEW *Budget Priced*

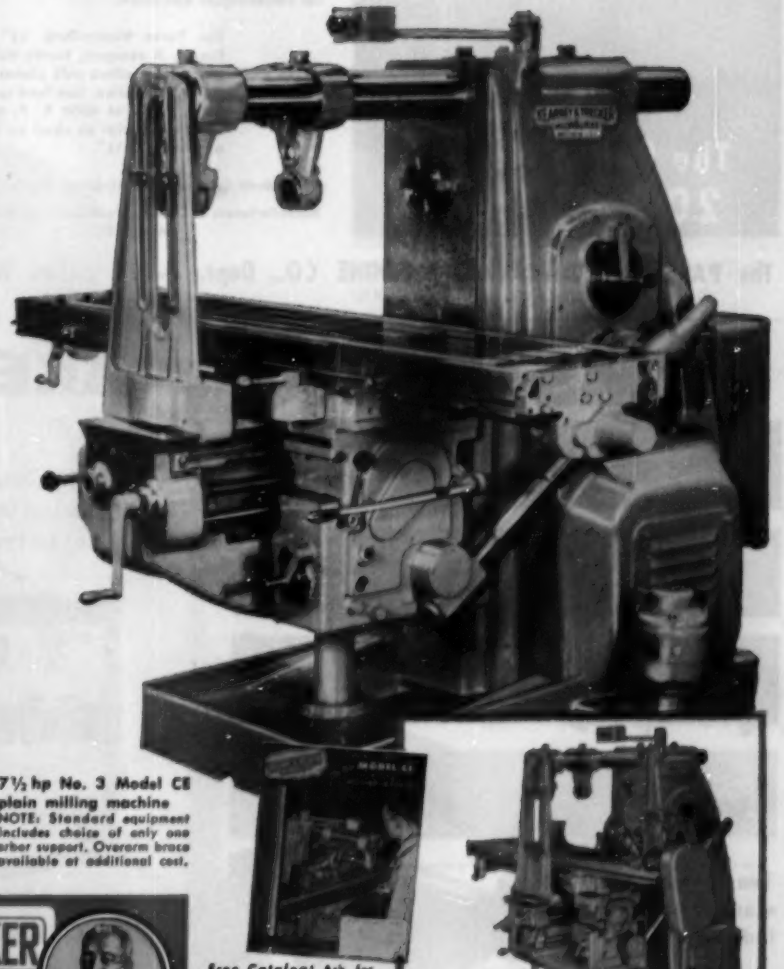
Plain and Universal Milling Machines

Kearney & Trecker announces the new Model CE 3hp No. 2 and 7½hp No. 3 . . . especially suited to school shop needs

HERE'S Kearney & Trecker's answer to Education's need for a new milling machine that combines quality with *low cost*. The new Model CE's give you the three most wanted features—*Efficiency, Ease* and *Economy* of operation.

The economical Model CE's are available in either No. 2 (3hp) or No. 3 (7½hp) size — both in plain and universal styles. The CE's feature 16 quick-change speeds (25 to 1300 rpm) and feeds (½ to 25 imp). They are ideally suited for a wide variety of application — especially useful in operator training and demonstration of milling operations.

For the full story, contact your nearest Kearney & Trecker representative, or write Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.



7½ hp No. 3 Model CE plain milling machine
NOTE: Standard equipment includes choice of only one arbor support. Overarm brace available at additional cost.

3hp No. 2 Model CE universal milling machine
NOTE: Standard equipment includes choice of only one arbor support. Only Conventional Lead Attachment (shown above) is available in Model CE Universal machines. Overarm brace available at additional cost.

Free Catalog! Ask for complete data on Model CE milling machines, catalog No. CE-10. Also see our catalog in Sweet's Machine Tool File.

Visual Aids
More than 250 schools and colleges use Kearney & Trecker equipment and visual training aids. Aids are available at nominal or no cost to educational institutions. Write for details.

Your Students Will Learn FASTER on a PARKS PLANER

The PARKS No. 20
20" PLANER

Students advance quickly on Parks Planers because they find them easy to operate, safe, and accurate. And, since both the Parks 12" and Parks 20" Planers have been designed and precision-built for accuracy and high-speed line production in industry, they are ideally suited for the school shop because they give practical experience on the type of machines your students will eventually use. Both machines are priced low enough for even the most modest shop budget.

The Parks No. 20. 20" Planer has a 4-knife cutterhead with a speed of 3600 R. P. M. and offers two feed speeds—20 and 40 F. P. M., and 40 and 80 F. P. M. Will take work up to 20" wide by 6" thick. Ruggedly built for vibrationless operation.

The Parks Heavy-Duty 12" x 4" Planer. A compact, sturdy thickness planer that offers mill planer precision at low price. Has feed speed of 16 F. P. M. at 4000 R. P. M. Will handle material as short as 6" and as thin as 1/16".

Write for complete descriptive literature.

Manufacturers of Quality Woodworking Machines since 1887.

The PARKS
Heavy-Duty
12" x 4" PLANER

The PARKS WOODWORKING MACHINE CO., Dept. —24, 1546 Knowlton St., Cincinnati 23, Ohio

ARMSTRONG

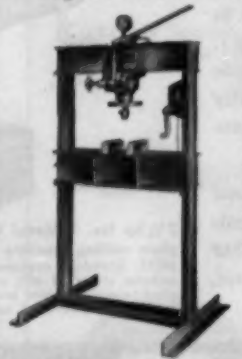
Teach with the standard tools of industry.

Write for Catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5222 W. Armstrong Ave. Chicago 30, U. S. A.
New York, San Francisco

DAKE PRESSES for School Shops

Shop training is most helpful when your pupils use the same practical presses they are apt to find when they work after graduation.



DAKE HYDRAULIC PRESS Model 25 H

Includes pressure gauge, hand wheel for rapid advance, automatic ram return, and table lifting device. 25 tons capacity.

DAKE ARBOR PRESSES

Have large opening and slotted table plates. Available in single and compound leverages, with capacities from 1 to 25 tons.

Catalog No. 350 describes Dake Presses suitable for school shops. Write for a free copy.

DAKE CORPORATION 653 Seventh Street Grand Haven, Mich.

OFFSET DUPLICATING

–easy to use
–easy to teach

When the principles of lithography were first adapted to offset duplicating, there came the promise that copies of linework, such as mechanical drawings —photographic illustrations, and typewritten or handwritten material could be produced with an appreciable savings in time and money.

The A. B. Dick offset duplicator, Model 350 fulfills that promise with a precision machine made to specifications and held to tolerances never before achieved in an offset duplicator.

Now, good copies in black or color can be produced immediately without time-consuming delays.

Now, you can maintain fine copy quality automatically with exclusive AQUAMATIC control.

Now, you can switch from the lightest paper master to a metal plate and from 12-pound paper to Bristol stock without changing cylinder or roller pressures.

Now, there is a feed table that is adjustable for different sizes of paper and card stock in seconds. Duplicating speed is faster than ever before—up to 9000 top quality copies per hour.

For more information simply mail the coupon below.

A·B·DICK
THE FIRST NAME IN DUPLICATING

A. B. Dick Company
5700 Touhy Avenue, Chicago 31, Illinois

Please send me more information about the new A. B. Dick offset duplicator, Model 350.

Name_____ Position_____

School_____

Address_____

City_____ State_____

A-6120

A. B. DICK and ⓐ are registered trademarks of A. B. Dick Company

the POWER TOOLS you wanted!

New heavy duty cabinet models... by DURO

You'll be creating confidence and building enthusiasm in your workshop work when your students train on DURO POWER TOOLS. This new line has been developed to meet your specific requirements for quality, utility, safety and price. Duro power tools are years ahead in design, ruggedly built to provide a lifetime of faultless service and they incorporate the priceless safety features you must have (with moving parts protected). Students operating Duro units are learning on equipment industry prefers too — tools that are rapidly becoming the "accepted standard" on wood and metal working jobs.

Send for FREE Power Tool Catalog and Shop Planning Guide

See firsthand how Duro power tools will fit your shop and budget. There are many units to choose from including circular, band and scroll saws, lathes, jointers, drill presses, disc and belt sanders, etc. The Duro planning guide will give you a clear insight into proper shop planning. Write today . . . both are free.

DURO METAL PRODUCTS CO.

2661 N. Kildare Avenue Chicago 39, Illinois

SAFE, DEPENDABLE
WOODWORKING MACHINES
For the School Shop

HAND JOINTER—compact and accessible. Built in 8" and 12" width. Table 6'2" long, maximum rabbet depth 9/16". Round, 3 knife safety type cylinder head, 3 HP 3600 RPM motor.

NO. 3 SURFACER—new, streamlined machine. Features simplified, mechanical design. Takes material 18" wide and from ⅛" to 8" thick.

NO. 4 VARIETY SAW—for variety sawing in any shop! Standard table 44" long and 36" wide, plus 19½" extension for carrying rip gauge table.

BAND SAWS— machine 20" diameter wheel illustrated. Floor space 24" x 36", horizontal capacity 20", vertical capacity under guide 11". Also 27" 32", and 36" machines available.

SHAPER—1" diameter spindle, with 4½" vertical adjustment, 34" x 26" table, spindle speed—6,500 RPM, floor space—34"x37".

Write for Catalog →

Northfield

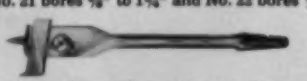
FOUNDRY & MACHINE CO.
NORTHFIELD, MINNESOTA, U. S. A.

New IRWIN Bit
lets you dial your size

Now bore 35 standard hole sizes with just one tool

Here is the new Irwin wood boring tool that does the work of a whole box full of individual sizes. And it costs much less, too. Just the easy turn of Irwin's patented Micro-Dial and it's set to go! No hunting, no fumbling for the size you need. No slow down of School Shop work. Clean, fast, accurate boring action in any wood. Fits all hand bit braces.

And the new Irwin Micro-Dial is built to deliver the longest possible service in your shop. It's drop-forged from special bit steel, heat treated full length, precision machined for accuracy and sharpness. Highly polished, too. Two cutters supplied with each bit. Replacement cutters also available. Put the Irwin Micro-Dial Expansive Bit on your requisition list today. No. 21 bores ⅝" to 1¾" and No. 22 bores ⅞" to 3".



No. 2 Lockhead Expansive Bit, Bores 35 standard holes, ⅞" to 3". Solid clamping device holds blade securely. Also available in No. 1 size which bores ⅝" to 1½". only **$3.15** ⅞" to 3" size

No. 22 Micro-Dial only $3.45 ⅞" to 3" boring range

IRWIN the original solid center auger bit
•
Wilmington, Ohio screw drivers — screw driver bits

GOODHEART-WILLCOX

OUTSTANDING VOCATIONAL TEXTS

Practical Books With Lots of SHOW-HOW

MODERN REFRIGERATION AND AIR CONDITIONING

By Althouse and Turnquist. This new textbook gives each student sound foundation in Air Conditioning and Refrigeration Principles and acquaints him with refrigerating mechanisms and their components. Covers application of refrigeration in all its branches — Domestic, Commercial Refrigeration, Residential and Automobile Air Conditioning, Heat Pumps, etc.

SHOP JOB SHEETS

To be used with Modern Refrigeration and Air Conditioning. Each job consists of instruction sheet, multiple choice questions, and data sheet. Great teaching aid.

PRACTICAL CARPENTRY (Over 1100 illustrations)

By Mix and Cirou. Used by more than 950 schools! An easy-to-understand encyclopedia of building information. Large, crystal clear drawings, show complete house construction details, from foundation to roof; reduces the job of building a modern home to simple steps. Places special emphasis on proper techniques so the beginner will understand and become acquaintd with accepted carpentry practices and the use of modern building materials.

MOTOR SERVICE'S NEW AUTOMOTIVE ENCYCLOPEDIA

By Wm. K. Toboldt and Jud Purvis. A complete automotive library in one easy to use volume. The encyclopedia teaches FUNDAMENTALS Principles of operation and Basic Service Procedures — the foundation on which a sound, thorough knowledge of auto mechanics is based. It describes in simple, non-technical language and shows by clear illustrations how car parts and units are constructed, how the parts work, what goes wrong, what is required to get top performances in Power, Speed, Economy, Safety. Used by over 550 schools!

AUTOMATIC TRANSMISSIONS SIMPLIFIED

By Jud Purvis. New 1956 Edition. Carefully explains transmission fundamentals; tells and shows how automatic transmissions are constructed, how they operate, and how to repair them. No detail is omitted. Up to the minute from cover to cover.

ALL ABOUT SMALL GAS ENGINES

By Jud Purvis. Brand New. Tells and shows how small 2-cycle, and 4-cycle engines are constructed; how they operate; what goes wrong; how to service and repair them. Wonderful opportunity to teach basic gas engine fundamentals applicable to automobiles, by working on lawn mowers, chain saws, outboards, etc. Very little space and equipment needed.

MODERN WELDING PRACTICE

By Althouse and Turnquist. Covers principles and procedure of every known welding practice; gives detailed information on metals and alloys; describes equipment and materials.

ALL ABOUT HOUSE WIRING

By Mix and Pritchard. Here's a real "how-to-do-it" book, covering all phases of MODERN house wiring. Tells how to determine exactly what wiring is needed; gives basic wiring fundamentals. Shows in 192 crystal clear drawings how to do wiring in both new homes and existing residences; wiring capable of serving SAFELY the lighting, appliance and equipment needs of today, as well as those of tomorrow.

PAINTING & DECORATING ENCYCLOPEDIA (New)

Complete library of professional know-how on painting, decorating and wood finishing, in one easy-to-teach from volume. Special 4-color section on color harmony; insert with modern finishes on actual wood veneers.

GOODHEART-WILLCOX CO.
DEPT. 233
1321 S. Michigan
Chicago 5, Illinois

GOODHEART-WILLCOX
OUTSTANDING VOCATIONAL TEXTS

1. Modern Refrigeration & Air Conditioning	$7.45
2. Refrigeration Job Sheets	2.00
3. Practical Carpentry	5.00
4. Motor Service's New Automotive Encyclopedia	7.95
5. Automatic Transmissions Simplified	5.45
6. All About Small Gas Engines	4.50
7. Modern Welding Practice	5.00
8. All About House Wiring	2.50
9. Painting & Decorating Encyclopedia	6.00
10. Fix Your Ford	2.95
11. Fix Your Chevrolet	2.95
12. Fix Your Plymouth	2.95
13. Auto Mechanics' Manual on Brakes & Steering	3.50
14. Automotive Service Management	5.00
15. Vocational Math (Shop Arithmetic) (art paper binding)	1.50
16. Vocational Math (Geometry, Algebra, Trigonometry) (art paper binding)	1.75
17. Plumbing and Pipe Fitting Layout Job Sheets	2.95
18. All About Power Tools (Paper)	1.00
19. Sheet Metal Die Design (Paper)	2.25
20. You Can Grow More Corn	3.50

PRICES SUBJECT TO CHANGE

MAIL COUPON TODAY!

GOODHEART-WILLCOX CO., 1321 S. Michigan
Dept. 233, Chicago 5, Ill.

Send me on 30 days approval the following books:

1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20

20% Discount to School and Teachers

NAME .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

Leading publishers of school textbooks since 1921

When you want the Best...

BUY MILLERS FALLS TOOLS

Today Millers Falls offers the broadest and finest line in its 88 years of quality tool-making—including many interesting new hand tools . . . a wide variety of better-than-ever metal cutting saws and blades . . . and the exciting Dyno-Mite line of portable electric power tools, attachments and accessories.

Write today for free copies of Hand Tool Catalog No. 49 and Electric Tool Catalog No. DM-55 illustrating and describing Millers Falls wide line of tools for the home, school shop, business and industry.

MILLERS FALLS COMPANY
Dept. IA-17, Greenfield, Mass., U.S.A.

MILLERS FALLS TOOLS
SINCE 1868
The Mark of Superiority

Industrial Arts and Vocational Education
The Shop Teachers' Professional Magazine
MARCH 1956

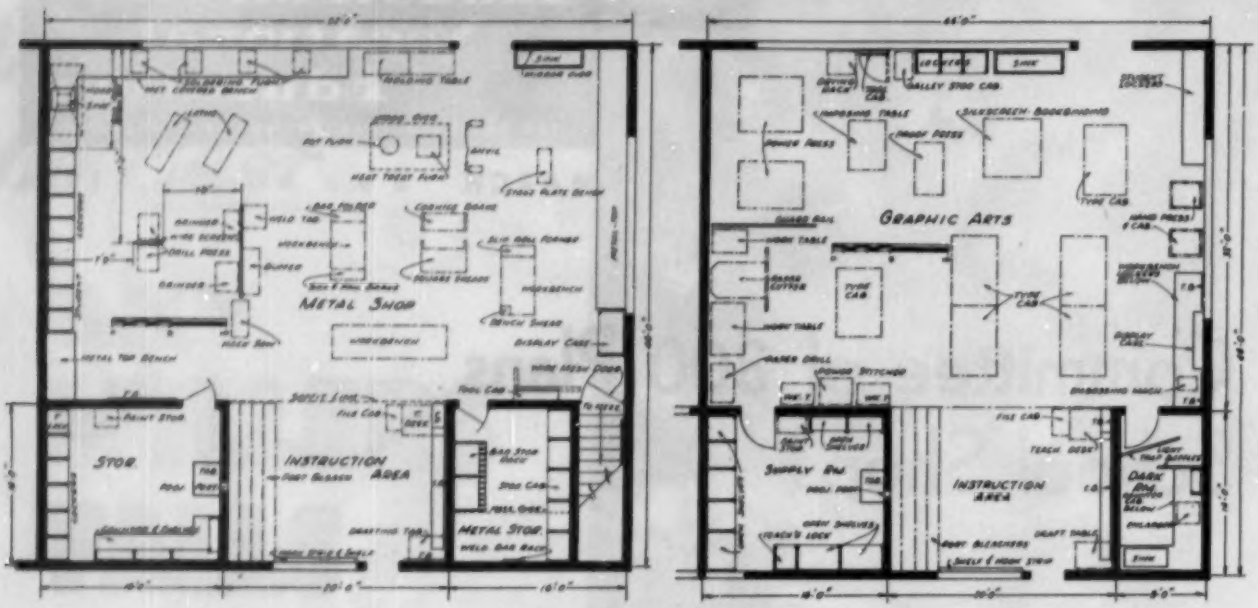
Committee of 300 Plans School Shops

J. LYMAN GOLDSMITH
Supervisor of Agricultural-Vocational-Industrial Arts
Division of Instructional Services
Los Angeles City Schools
Los Angeles, Calif.

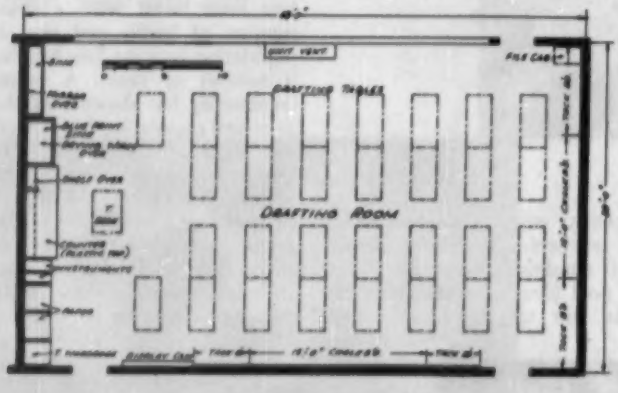
"Too many cooks spoil the broth." This adage has meaning and application only in those cases where work accomplished is not channeled toward a common goal or objective. It did not apply recently when a committee of over 300 teachers, supervisors, principals, and administrators worked together to pool ideas in establishing the "standards" for the new junior high school industrial-arts shops in the Los Angeles city schools.

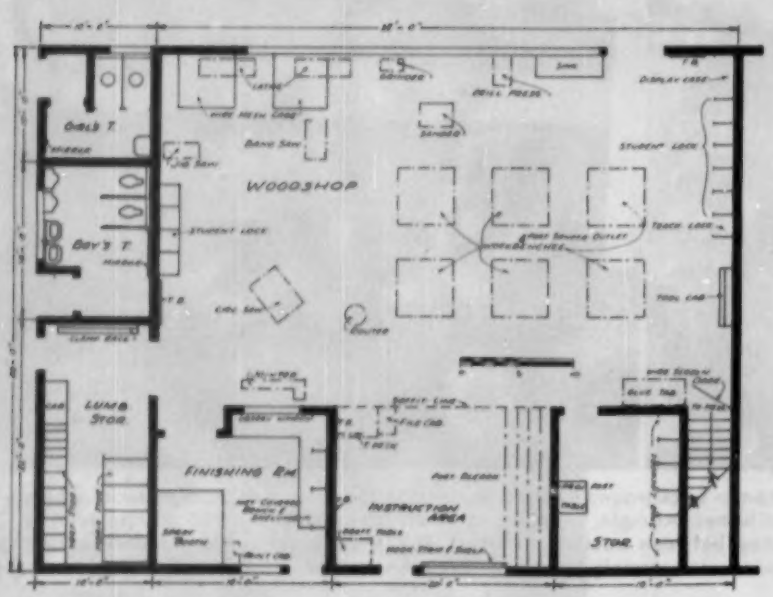
The Los Angeles City School District has been faced with a mushrooming number of births and the shifting of population into the Los Angeles area for a number of years. A survey of the community has shown that the increase in school population has not yet reached the stage of leveling off. Day school enrollment in the school district has increased from 317,000 in 1948 to a present figure of almost 440,000, an increase in pupils larger than most school districts have in total enrollment. The average annual increase of 19,000 pupils over a six-year period, coupled with

View of the general wood shop. Screen in background protects students in the shop area from material which might be thrown from the two wood lathes. At right, instructional area (approximately 280 square feet) is located in each junior high school shop between auxiliary rooms. The area is used for demonstrations, shop talks, and viewing audio-visual materials projected through auxiliary room wall at right



Metal shop and graphic-arts shop





the quarter million new arrivals expected from 1955 to 1960 according to *stork surveys*, have made it mandatory that adequate provisions be planned for present and future needs.

Months of tedious research work and calculations by members of the school district's staff furnished data which indicated that in order to keep some semblance of pace with anticipated growth, the school district would need to build 35 new elementary schools, 15 new junior high schools, and 5 new senior high schools. This building program should also take care of countless additions and numerous alterations to the existing school plants.

The building program posed the problem of whether a set of building standards could be formulated to serve as guide lines for architects working on school plans. How should the planning for new facilities be handled? School district administrators agreed that facilities for each instructional program should be planned by those directly concerned with the individual programs. Teachers were to be consulted concerning ideas which could be added to the specialized suggestions made by staff personnel involved with educational housing and equipment. The experience in building and equipping 367 elementary schools, 45 junior high schools, 42 senior high schools, and 7 junior colleges would be used to serve as the foundation block in planning for new construction standards.

Supervisory personnel in each instructional area were given the responsibility of working with teacher groups to develop the standards which would

View of graphic-arts shop showing one of the two printing presses with double type stands in the foreground. Students are working on rubber stamp making, embossing, and silk screen processes at the far wall. At right, a partial view of industrial drawing shop showing instructional area in background. All shops feature lumiline lighting

apply to the new building program. The method and plan used to develop the junior high school industrial-arts standards is representative of the pattern followed in all subject areas.

1. A series of basic institutes was held involving all junior high school industrial-arts teachers. The teachers participated in both general over-all planning meetings and subject-area work sessions.

2. In-service training workshops (organized for point credit applying to salary) were organized in which attention was given to special problems and details.

3. Conferences were scheduled with staff specialists to check on the latest trends in educational housing and equipment.

4. Composite reports summarizing committee work were compiled and presented to all junior high school industrial-arts teachers for suggestions.

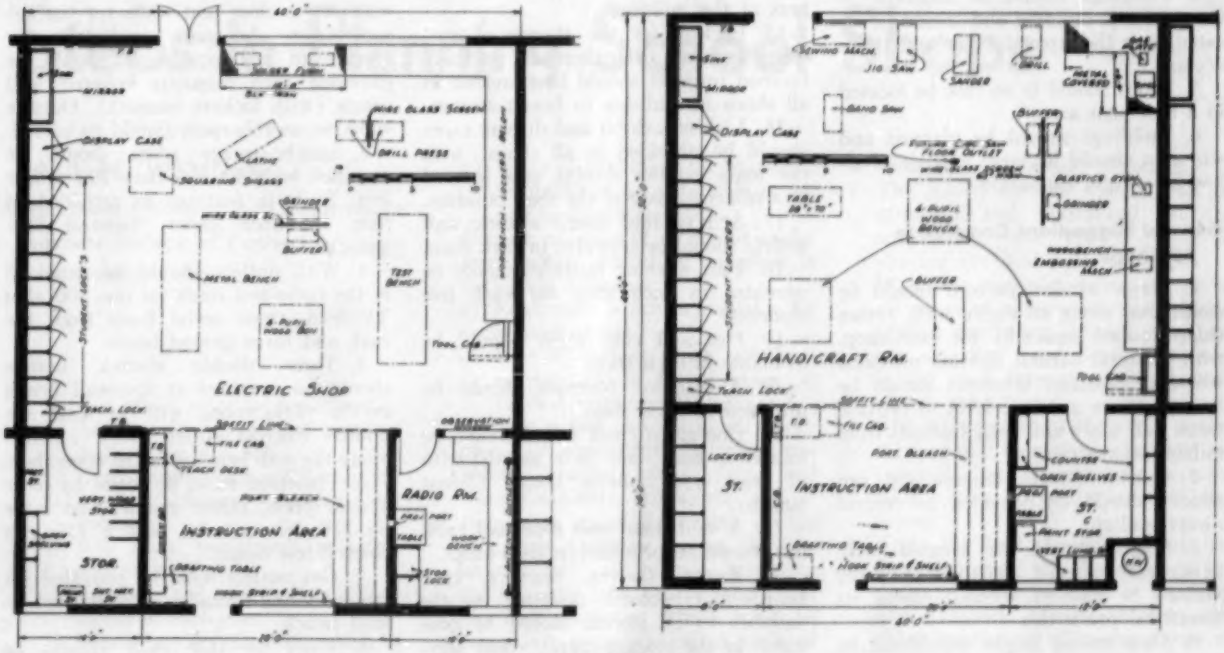
5. Suggestions were solicited from school principals and administrators who had been given copies of the composite committee report.

6. Tentative final report, compiled from all suggestions, was submitted for review to the over 300 people who had been involved in the preparation of the building *guide lines*.

7. Final report was prepared and edited by the industrial-arts supervisor working with an advisory committee of shop teachers.

8. Final report was then submitted to the school district administration for use with architects working on plans for new junior high school shop facilities.

Suggestions or *guide lines* for the



Electrical shop and handicraft room

planning of industrial-arts facilities for the Los Angeles city junior high schools were based on the following factors:

1. The point of view of the junior high school industrial-arts program. This program consists of a sequence of six required 10-week exploratory courses in the B7, A7, and B8 grades (handicraft, industrial drawing, general electricity, general wood, general metal, and graphic arts) and an elective program of one or more of these courses offered in the A8, B9, and A9 grades on a full 20-week or full semester basis. The industrial-arts program is conducted in limited general shops; each one representing a broad industrial field.
2. The major items of standard equipment that are included in each limited general shop and through which activities are carried on.
3. The average class size of 25 boys.
4. The safety elements as applied to each industrial-arts activity.
5. The industrial-arts teacher.

Suggested Standards for Planning Junior High School Industrial-Arts Facilities

The Shop Buildings

1. Shops should be housed in one or not more than two adjoining buildings as an integral part of the total school plant.
2. Buildings should be not more than one story in height.
3. Buildings should be connected to other buildings on the school site by covered walk passages of the open pergola type.
4. Buildings should be adjacent to the academic building and should be located near the street for car and truck access.
5. Shops should in no case be located in a basement area.
6. Buildings should be planned and site area should be large enough to allow for future expansion.

General Suggestions Common to All Shops

1. Major window pattern should be continuous along an entire wall, rather than grouped especially for each shop, with bilateral natural lighting provided wherever possible. Windows should be located above a 7-foot level to provide extra wall space and keep students from outside distractions.
2. Outside panels, louvers and sun shades should be provided to control direct sunlight.
3. Shops should be treated with acoustical material capable of being stained or painted without losing its acoustical properties.
4. Shop ceiling height should not be less than 16 feet.
5. Shops should be painted in keeping with proved paint research — color dynamics. Ceilings and wall above a 7-foot dado should be white. All woodwork, lockers, tool cabinets, and the exposed walls below the dado should be painted a pastel green.
6. At least two double doors should be provided for each shop.
7. Overhead heating should be provided in each shop. Heating system should provide a temperature of 68 degrees measured 60 inches above the floor with automatic control. Temperature variation should not be more than five degrees from floor to 60 inches above floor.
8. Individual panels controlling the electrical service should be provided in each shop.
9. Conduit and other utility services should be provided on a liberal basis to provide for future needs.
10. Partitions between shops should be nonbearing curtain walls as free as possible from mechanical and utility lines.
11. The open shop area (exclusive of auxiliary rooms) should be on a width to length ratio of 1 to 1½.
12. Auxiliary rooms for each shop should be grouped together.
13. Artificial light should be furnished by fluorescent units provided with glass or plastic *guard* sheets and box diffusing grills. At least 35 footcandles of light should be available at bench height.
14. Heavy equipment should be mounted on concrete bases projecting to floor level, and insulated from the floor slab and other structural members of the building.
15. Lockers for the storage of students' personal belongings and partially finished projects should be provided in all shops in addition to bench storage.
16. Lighted exhibit and display cases should be provided in all shops: with one main exterior display case located in a principal part of the shop building.
17. At least four double electric wall outlets should be provided in each shop.
18. Unit washing facilities should be provided in each shop for each five students.
19. Hot and cold water should be available in each shop.
20. A drinking fountain should be provided in each shop.
21. One green chalk board should be located in each shop (6-ft. length) with at least one bulletin board (3-foot length).
22. A split door, wall type tool cabinet should be provided in each shop.
23. Racks, shelves, drawers, cupboards and cabinets, designed for the supplies to be stored, should be provided in the storage-supply room serving each shop.
24. Toilet facilities should be provided in each shop area, unless general toilet facilities have been provided in the over-all shop building.
25. All sinks to be trapped for waste.

Specific Suggestions by Areas

Instructional Center

1. Each shop should be provided with an instructional center of at least 280 square feet, located between auxiliary rooms. This area to be equipped for audio-visual presentations, curtained from working area of shop, equipped with folding bleachers, chalk board, artificial lights, mechanical ventilation and partitioning curtains.
2. A demonstration or classroom should be provided in each shop building (at least 480 square feet) if instructional centers are not incorporated in individual shops. This unit would provide facilities for demonstrations, related material presentations, audio-visual use for approximately 36 boys. It should be equipped with a demonstration bench with reflecting mirror, 10 feet of green chalk board, screen storage cabinets, one electric outlet on each wall, and with gas, water, and electricity available at the demonstration bench. Artificial lights and mechanical ventilation should be provided.

Electricity

1. Shop should not be less than 1900 square feet including supply-storage room and test radio room.
2. The radio-test room should be approximately 150 square feet with glass windows in door and walls for teacher supervision. Adequate cupboards for storage of test equipment should be provided with masonite covered wall bench (with lockers beneath). Outside windows on this room should be barred.
3. Supply-storage room should be provided with not less than 100 square feet. Built in features as provided in item 23 listed under "General Suggestions."
4. Wall outlets should be provided in the radio-test room for one 300 ohm TV lead, three aerial leads from the roof, and three ground leads.
5. Three double electric outlets should be provided at the wall bench in the radio room, with at least one double electric outlet every 10 feet along the wall benches in the open shop.
6. Provision must be made to serve a drill press, motor grinder and lathe on 220 volt circuits, with a 110 volt electric test bench.
7. Gas outlets must be provided for two soldering furnaces to be located on wall bench.
8. Floor in this shop should be maple.

General Metal

1. Shop should be planned for not less than 2100 square feet, including auxiliary rooms.
2. Floor should be concrete marked in 4 foot squares.
3. Hood and vent should be provided for heat unit (melting pot and heat treating furnace — gas) and same for acid table and sink.
4. Supply and storage rooms should be provided as indicated in item 23 under "General Suggestions" with not less than 170 square feet area each and a minimum of 8-foot ceiling.
5. Approximately 50 feet of window bench (with closed lockers beneath) should be provided. These benches should have angle iron edge and sheet-metal cover.
6. Provision should be made to serve two lathes, power hack saw, two drill presses, grinder, buffer, and metal shaper on 220 volts.
7. Mezzanine floor with stairway access should be built over supply and storage rooms for storage of projects and long stock.

Graphic Arts

1. Shop should be planned for not less than 1900 square feet.
2. Floor should be maple.
3. In addition to adequate supply-storage room (approx. 160 square feet), a darkroom with light safe door should be provided (approx. 80 square feet).
4. Darkroom should have at least two double electric outlets, wall bench with cupboards beneath, storage locker, sink, and light safe door.
5. At least 20 feet of wall bench (maple top) should be built in shop area (with closed cupboards beneath.)
6. Provision should be made for a power stapler and two platen printing presses on 220 volt electricity.

General Wood

1. Shop should be planned for not less than 2200 square feet.
2. Floor should be maple or end grain wood block.
3. Ventilation fan should be built into the finish room.
4. Spray booth facilities should be built into the finish room.
5. Finish room should not be less than 180 square feet.
6. Supply-storage room should be provided with not less than 100 square feet.
7. Mezzanine floor with stairway access should be built over supply-storage room and finish room for storage of long lumber and large projects, and must have at least an 8-foot ceiling.
8. Provision should be made to service a band saw, circular saw, jointer, jig saw, drill press, tool grinder, router, shaper, mortiser, and two lathes on 220 volt current.
9. Finish room must have glass window in the door and the shop walls for teacher supervision.

Industrial Drawing – Handicraft

1. Combined activity should be planned for not less than 1900 square feet. Industrial drawing alone, not less than 1600 square feet; handicraft alone, not less than 1750 square feet.
2. Floor should be maple or asphalt tile.
3. Provision should be planned for the service of a drill press, grinder and buffer, jig saw, belt and disk sander, and an electric heating oven. All items, except the oven, to operate on 220 volts.
4. At least 12 feet of wall benches to be built in (with lockers built beneath).
5. Blueprint room of approximately 100 square feet should be planned complete with sink, workbench, drying racks, cupboards, and electric outlets.
6. Supply-storage room of 100 square feet should be planned as per item 23 under "General Suggestions."
7. Special trap should be provided on sink to provide against clogging during use of plaster of Paris, clay, and other materials.
8. At least 10 foot of glass case tack board should be provided.

Architects have made some minor changes in new shops being planned along the pattern suggested by the "guide lines." These changes have been made because of teacher use of the first shop units built on the new standards. The value of combined shop planning work of teachers, supervisors, principals, and administrators has been proved in the new junior high school shops.

Steps in Planning School Shops

PAUL N. WENGER
Chairman, Industrial Arts Department
Teachers College of Connecticut
New Britain, Conn.

1. Factors which must be considered.
   a) Areas to be taught and units of work to be included.
   b) Grade levels which will be taught.
   c) Size of classes — present and future.
   d) Will there be classes in adult education?
   e) Number and size of auxiliary rooms in each area.
   f) Degree of concentration which is directed toward trade training.
   g) Ways of providing for maximum flexibility so as to be able to adjust to future demands.
2. Prepare a listing of all major equipment which should be installed in each area, including:
   a) Equipment which is available for immediate use.
   b) New equipment which you hope to purchase in future years, as funds become available.
3. Prepare scaled cutouts of all major pieces of equipment, including machines, benches, sinks, filing and storage cabinets, tables, etc.
4. Prepare a scaled floor plan of the shop and auxiliary rooms, showing location of all doors, windows, chalkboards, tack boards, and other physical properties which must be taken into consideration. A scale of ¼ in. equals 1 ft. is used rather widely in preliminary planning.
5. The scaled cutouts should then be arranged and rearranged on the scaled floor plan, *always trying to develop the best possible layout.*
6. Whenever possible, scaled models of all pieces of major equipment should replace cardboard cutouts. A person can visualize more clearly the shop layout when three-dimensional models are used.
7. The arrangement of the major equipment should then be checked and rechecked by experienced persons, *with a view to improving the shop layout.*
8. After the best possible layout has been achieved, an attractive scaled drawing should be made of the shop and auxiliary rooms, showing the exact location of all major pieces of equipment.

Industrial Arts at Alexander Ramsey High School

DOUGLAS O. DeLANO

Alexander Ramsey Junior-Senior High School

St. Paul, Minn.

Alexander Ramsey High School was designed and built to meet the secondary education needs of a typical suburban community which lies adjacent to both Minneapolis and St. Paul. The program for which the school was built seeks to meet the needs of individual children. There are no study halls and all students are given opportunities for some shop courses even though they may be college bound.

The industrial-arts department is designed to offer exploratory and informational courses as part of the general education of boys and girls. The aim is to provide a wide variety of experiences with materials, tools, and machines in the main industrial-arts fields. The department has area shops in metal, wood, electricity, and graphic arts. There is also a drafting room and a classroom, shop library for class lectures, planning, testing, reference reading, and audio-visual instruction.

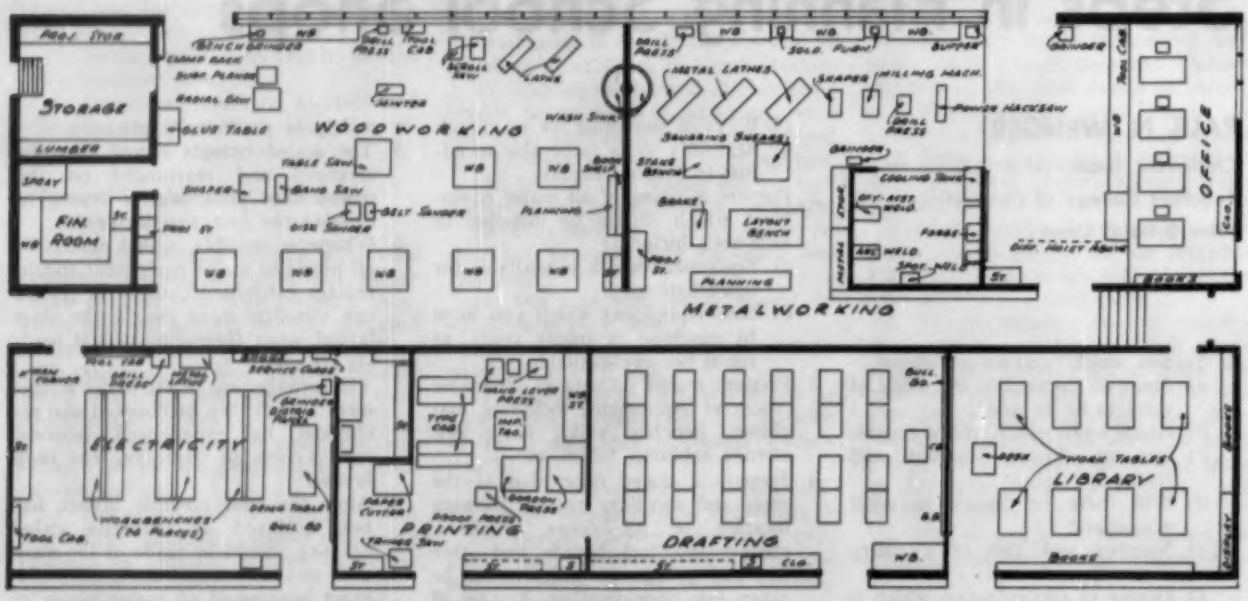
The broad scope of this industrial-arts department includes work in bench metal, sheet metal, welding, art metal, automobile maintenance, machine work, woodwork, plastics, electricity, electronics, sketching, mechanical drawing, architectural drawing, block printing, silk screen work, and printing. Specialization in courses is reserved for the eleventh and twelfth grades.

The industrial-arts section of this new school, now in its third year of operation, is located at the east end of the special departments wing. This makes it convenient for delivery of materials and supplies to the shops and the location also makes for ease in handling completed student projects.

The finishes in the industrial-arts rooms are comparable to those used throughout the rest of the building. Natural hard maple is used throughout for all bench and casework. Hard maple flooring is also used in the wood and metal shops with the exception that the welding area and the auto maintenance section of the metal shop have finished concrete floors. An asphalt tile floor is used in the drafting room while a rubber tile floor is used in the shop library-classroom in order to secure a quieter atmosphere and good acoustics.

All ceilings are fully acoustically treated to deaden sound reverberations and fluorescent lights provide uniform, high level illumination in all areas. An under the floor dust collecting system keeps the woodshop air clear and well ventilated at all times.

To facilitate maximum use of all shop areas with a minimum of interference to the teachers, to make it easier for an instructor to work in several shop areas and to keep office space free from the noise of the shops, a large office was



Floor plan of the industrial-arts department at Alexander Ramsey High School, St. Paul, Minn.

The metal shop, looking toward the north wall, at left. At right, looking from the southwest corner in the bench area

Two views of the wood shop. At left looking toward the southeast corner of the room, and at right, looking toward the west wall of the room

Above views of electricity room show the southeast corner of the room at left, and looking toward the north wall on the right

provided separated from, but adjacent to the shops. Note on the plans how this large office provides a light, quiet, clean place for the instructors to plan and to hold individual conferences.

The present faculty of the industrial-arts department and their major fields of instruction are: woodwork, Douglas O. DeLano; electricity, Kenneth R. Fechter; printing, Raymond Hughes; metalwork, Raymond King; drawing, Robert Penning.

At left, the print shop, looking toward the southeast corner of the room. At right, the drafting room, looking toward the south wall

— Photographs, Fletcher Tyler, St. Paul, Minn.

The Chambersburg Area Senior High School

J. FRANK FAUST

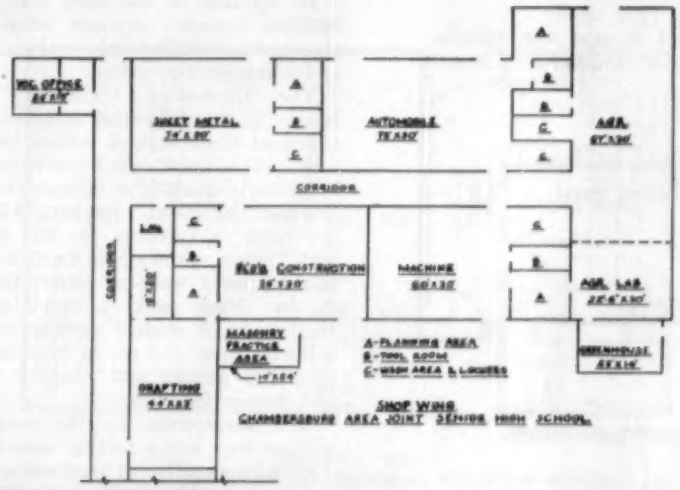
District Superintendent, Chambersburg School District
Chambersburg, Pa.

The Chambersburg Area Senior High School built and equipped at a cost of $3,265,000 with a 1200-pupil capacity is located on a twenty acre site within the borough limits of Chambersburg, Pa. It was completed in the early spring of 1955 and occupied for the first time March 14, 1955. The building was made possible by the combined and co-operative planning and effort of the Chambersburg School District and the five surrounding districts of Greene, Guilford, Hamilton, Letterkenny, and Lurgan Townships, organized as the Chambersburg Area Joint School Board. The architectural and engineering work for the building was done by the firm of Lawrie and Green of Harrisburg, Pa. The financing of the building was handled by the Chambersburg Area Joint School Authority.

This impressive H-shaped building presents a striking exterior appearance due to its exact conformity to the topography of the site, its simple architectural style, its great areas of glass, and its walls of light tan colored brick, West Virginia stone ashler, and green stone.

The interior of the building is both interesting and beautiful. Some of the outstanding features of the interior are complete acoustical treatment of all ceilings and many of the walls; terrazzo, asphalt tile, and ceramic tile flooring; locker-height tiling in the corridors; extensive use of natural finish oak paneling for decorative effects in various parts of the building; Fiberglas draperies in delicate shades throughout the building; natural finished hardwood furniture of the individual table and chair type in the classrooms; multi-tinted walls; spacious lobbies for the auditorium, gymnasium, and cafeteria; gates providing for zone use of individual areas of the building; fully upholstered seating in the auditorium; large display areas; ample incandescent and fluorescent direct and indirect artificial lighting; unusual natural lighting due to the large glass areas; and the beautifully furnished administrative offices.

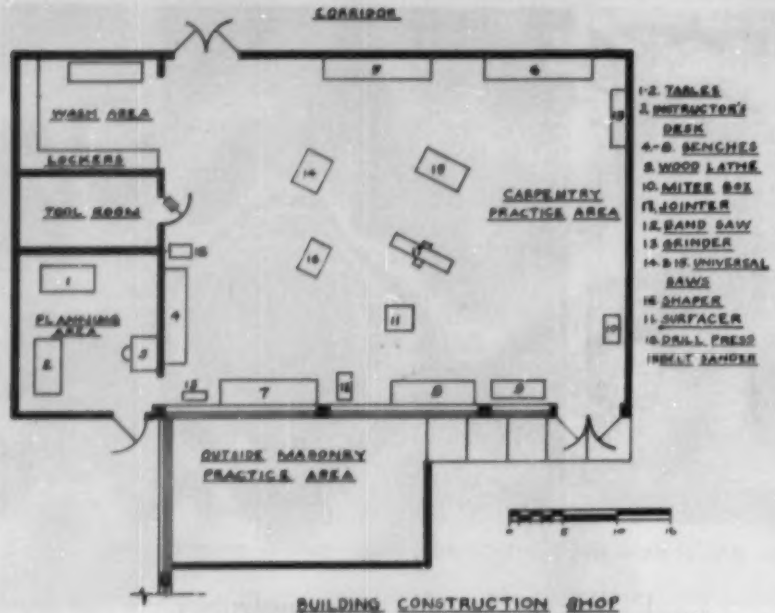
At left, the building trades shop, and at right, the building trades shop — outside masonry area



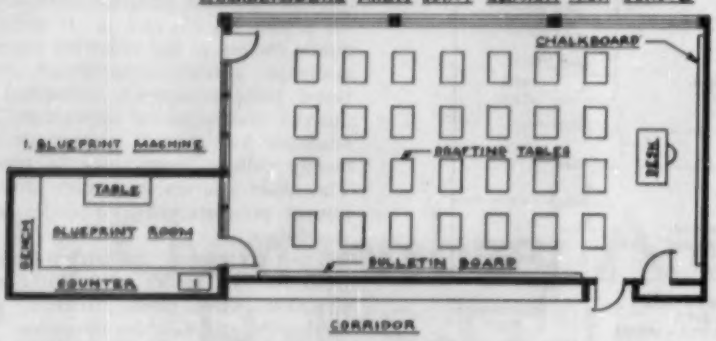
The Chambersburg Area High School is organized as a comprehensive school for grades 10, 11, and 12. It offers to pupils choices of the following courses: academic, general, commercial, vocational home economics, vocational industrial, and vocational agriculture. The academic and general courses are primarily college preparatory in nature. The other courses lead more directly toward occupational possibilities upon graduation.

The vocational industrial courses train for the trades of building construction, sheet metal, welding, auto mechanics, and machine operation. The boys in these courses spend half time in classrooms for related studies. The work of the department is so organized that boys whose interests center in trades

Two views of the vocational agriculture shop at Chambersburg Area Senior High School
— Photographs, Robert L. Glessner, Sr. Chambersburg, Pa.



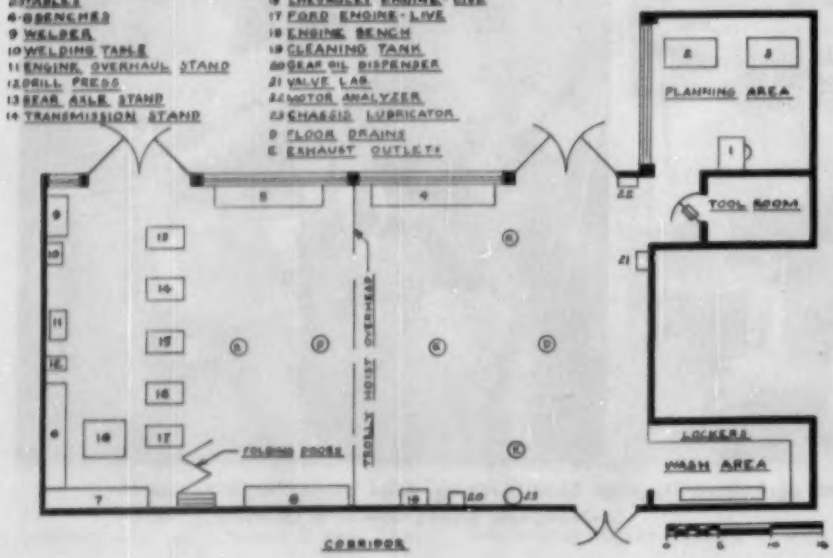
BUILDING CONSTRUCTION @ HOP
CHAMBERSBURG AREA JOINT SENIOR HIGH SCHOOL



DRAFTING ROOM
CHAMBERSBURG AREA JOINT SENIOR HIGH SCHOOL

AUTOMOBILE SHOP
CHAMBERSBURG AREA JOINT SENIOR HIGH SCHOOL

1 INSTRUCTOR'S DESK
2 TABLES
4-6 BENCHES
9 WELDER
10 WELDING TABLE
11 ENGINE OVERHAUL STAND
12 DRILL PRESS
13 REAR AXLE STAND
14 TRANSMISSION STAND
15 PLYMOUTH ENGINE - LIVE
16 CHEVROLET ENGINE - LIVE
17 FORD ENGINE - LIVE
18 ENGINE BENCH
19 CLEANING TANK
20 GEAR OIL DISPENSER
21 VALVE LAB
22 MOTOR ANALYZER
23 CHASSIS LUBRICATOR
D FLOOR DRAINS
E EXHAUST OUTLETS



other than those offered in the school may secure such training on a co-operative basis — half time outside school with an employer and half time in school for related work. Careful supervision of such outside training is one of the duties of the director of vocational education.

The adult evening school with an enrollment of some 700 makes available to out-of-school youths and adults the shop facilities as well as the rest of the school plant.

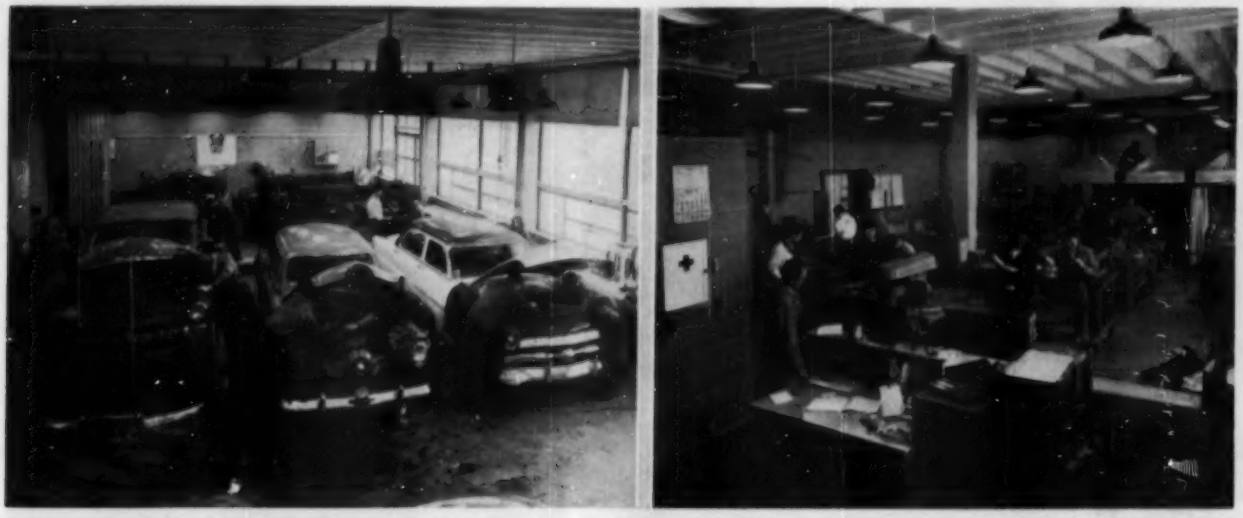
The shop layout as portrayed on these pages is but one section of the Chambersburg Area Senior High School building. The building as a whole was planned and designed to fulfill the needs of a modern, broad, general high school, including curriculum efficiency, safety and well-being, interfunctional co-ordination, efficiency and utility, beauty, adaptability, and economy.

In addition to the shop wing, the building includes separate wings for classrooms, auditorium, gymnasium, and administrative offices.

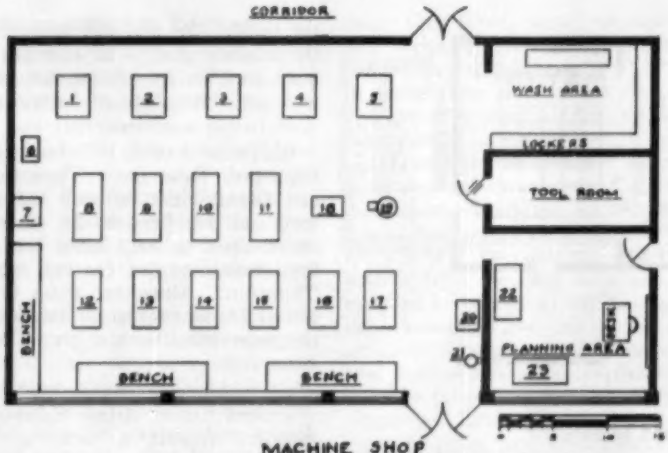
The three-story classroom wing houses 18 standard-sized classrooms, 6 oversized classrooms; 5 science laboratories; 6 business education rooms; 3 vocational homemaking laboratories; an arts and craftsroom, a mechanical drawing room; a cafeteria for 500 pupils with kitchen, dishwashing room, a large pantry and 5 walk-in refrigerators; a faculty dining room; 2 visual education rooms; 3 student activity rooms; a library suite of 4 rooms to accommodate 100 pupils; and adequate toilet and storage facilities.

The auditorium on the northeast ground floor has a seating capacity of 1500 with an adjacent band and orchestra room for 100 pupils, a vocal music room for 100 pupils, a speech and dramatics room, 2 dressing rooms, individual practice rooms, and storage rooms for uniforms, band instruments, and stage properties.

The gymnasium proper on the southwest ground floor with a floor space of approximately 14,600 square feet is arranged for division into two gymnasiums for boys and girls by means of a motorized folding partition. Folding fixed and rollaway bleachers provide seating for 2400 spectators. The main gymnasium is flanked at its ends by corrective gymnasiums — one for boys and one for girls. On a level with the gymnasium floor on the north side are separate shower and locker rooms for boys and girls, and on the south side are large storage rooms for apparatus and equipment. Under the boys' corrective gymnasium are two team rooms of ample size for accommodation of home and visiting teams.

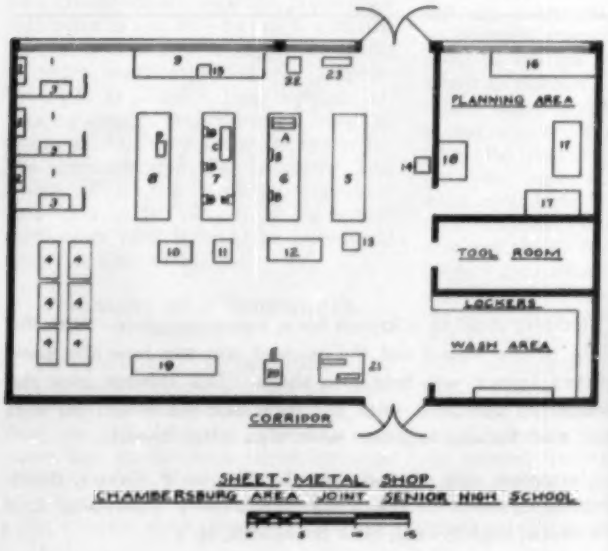


Auto mechanics shop at left, and sheet-metal and welding shop at the Chambersburg Area Senior High School



MACHINE SHOP
CHAMBERSBURG AREA JOINT SENIOR HIGH SCHOOL

(1) Surface Grinder; (2) Universal Grinder; (3 & 4) Shapers; (5) Universal Milling Machine; (6 & 20) Tool Grinders; (7) Heat Treating Furnace; (8–17 Lathes; (18) Power Hack Saw; (19 & 21) Drill Presses; (22–23) Tables.



SHEET-METAL SHOP
CHAMBERSBURG AREA JOINT SENIOR HIGH SCHOOL

1 WELDING BOOTHS
2 ELECTRIC WELDERS
3 WELDING TABLES
4 ACETYLENE WELDING UNITS
5-9 BENCHES
10 36" FOOT POWER SHEAR
11 BAND SAW
12 BOX & PAN BRAKE
13 DI-ACRO BENDER
14 DRILL PRESS
15 BENCH DRILL PRESS
16 DRAFTING TABLE
17 TABLES
18 INSTRUCTOR'S DESK
19 CORNICE BRAKE
20 SPOT WELDER
21 GROOVERS
22 GRINDER
23 BUFFER
A FORMING ROLL
B ROTARY MACHINES
C BAR FOLDER
D BEVERLY SHEAR

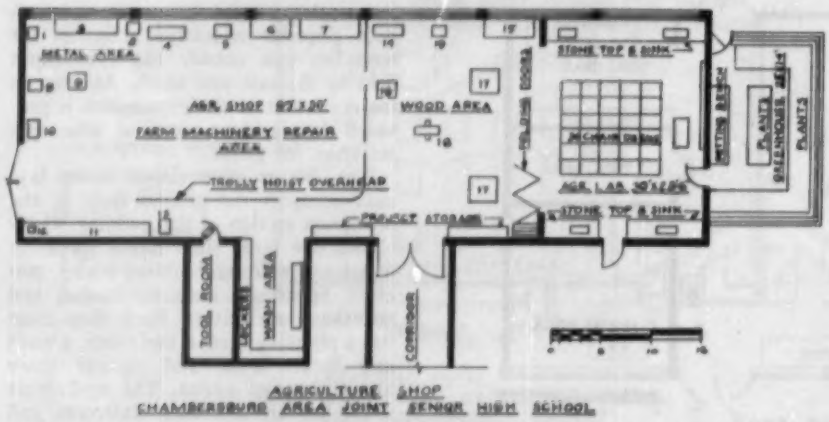
An athletic field for games and outdoor physical education activities for boys lies just outside the gymnasium field to the east and south. An area to the northwest of the gymnasium is provided for outdoor physical education activities for girls.

The shop wing as shown in the layouts occupies the ground floor of the northwest section of the building. It includes five large shop rooms for sheet metal and welding, building trades, machine operation, auto mechanics, and vocational agriculture. Each shop room has a planning area, a tool room, a wash and locker area, and storage space above the tool rooms. The agriculture room has an adjoining classroom and greenhouse. Just outside the building trades shop is a masonry practice area. The auto-mechanics shop has a folding partition at one end which provides a paint spraying room when needed. Adjacent to the shop wing are the blueprint room, the mechanical drawing room, and the vocational director's office.

The administration wing occupies the southeast part of the building and houses both the high school and the general administrative offices for the entire school system. It houses two public offices, 6 private offices, two lounges for teachers, guidance rooms, a health suite, a teachers' work office, a large staff conference room, two record storage vaults, two mimeograph rooms, storage rooms, and toilet facilities.

Occupancy of the building has proved that original planning was sound. The building is both beautiful and functional. The easy movement of pupil traffic, the absence of traffic bottlenecks; the apparent relaxed feelings of

At left, the machine shop, and at right, the drafting room



AGRICULTURE SHOP
CHAMBERSBURG AREA JOINT SENIOR HIGH SCHOOL

(1) Heat Treating Furnace; (2) Electric Welder; (3) Soldering Bench; (4) Metal Lathe; (5) Grinder; (6) Plumbing Bench; (7) Electrical Work Center; (8) Drill Press; (9) Welding Table; (10) Acetylene Welding Unit; (11) Bench; (12) Grinder; (13) Drill Press; (14) Wood Lathe; (15) Bench; (16) Circular Saw; (17) Woodworking Benches; (18) Jointer; (19) Band Saw.

the pupils; the zeal and enthusiasm of the teaching staff — all combine to induce an effective educational program with an atmosphere of happiness.

Big business needs little business more than ever these days. Three-thousand and twenty-eight different subcontractors and suppliers in 23 states were called upon to help build the world's first atomic engine for the submarine "Nautilus." Altogether these firms received 58 per cent of all funds paid by the government for the job. — *Westinghouse News.*

United States Army Europe headquarters reports a total of 61,562 officers and enlisted men enrolled in its educational program. — *Wisconsin Military Information Section.*

Student making a layout for a transition piece. With the help of the visual aid the student can see how the completed layout will fold into shape. The student uses the model to compare with his development which he cuts out and fastens together with tape after layout.

Instructor and photography by Charles F. Green, drafting department at the Middlesex County Vocational and Technical High School, New Brunswick, N. J.

Outline for A Graphic-Arts Laboratory

OTIS H. CHIDESTER
Graphic Arts Department
Tucson High School
Tucson, Ariz.

Graphic Arts vs. Printing

The old idea of placing printing in the industrial-arts curriculum by selling the administrator or board of education on the fact that here is a department that can save the school money and eventually pay for the cost of the equipment is fast disappearing from the industrial-arts picture, due to the more recent trend in industrial-arts education — the unit general shop and laboratory shop.

The prospective graphic-arts instructor who attempts to sell the administration with this view in mind, or the administration which establishes a print shop in the industrial-arts department with the idea of saving the school money, is relegating that shop to just what the name implies — *a print shop.*

If the administration is not willing to establish a graphic-arts shop for good educational values, or if the prospective instructor is not able to teach with the idea of exploring as many of the thirty or more ramifications of the graphic-arts field as possible, then both are attacking graphic-arts education from the wrong angle. It would be far better for the administration, the instructor, and above all for the student, if graphic arts were to be left out of the school curriculum until it could be introduced under proper conditions.

Philosophy of a Graphic-Arts Laboratory

The philosophy of industrial arts, and in particular graphic arts, has been expressed by many authorities in the field of industrial-arts education, in many and varied ways, so no attempt will be made here to set up a new list of criteria or to evaluate the philosophies already given. However, it is felt that the three basic objectives of any industrial-arts education program should be stated here, and a few words of explanation given about each objective as it applies to the graphic-arts laboratory:

1. The experience should have value as general education, for of all the industrial-arts shops, the student probably knows least about the graphic arts; yet his life will be constantly in contact with it from the time he arises in the morning and looks at the morning paper, throughout the day in his use of all kinds of paper material, books, business forms, and again in the evening when he takes time to read his favorite magazines. Little does he know about types of paper and why they vary in finishes, pictures and how they are translated from a photograph to the picture at which he is looking in the newspaper, the part typographical layout and colors play in the advertising propaganda which is all about him, why some papers are soft as silk, others as tough as rawhide, some waterproof and others water receptive, what an etching is and why one costs the price it does, what the difference is between wood, linoleum, and rubber block printing, what good taste is in personal graphic-arts supplies, what is desirable yet economical in business forms, which bindery processes are cheap and which are durable. These are just a few of the experiences that should impart general knowledge and make the student a more intelligent consumer of graphic-arts products.

2. The experience should be avocational in nature in that it may result in the student finding a hobby which he might pursue through life. Some of these might be: bookbinding, block printing, silk screen printing, etching, the collecting of fine graphic-arts specimens, the establishment of a small press to produce artistic printing or some phase of photography such as black and white, color, movies, contact printing, enlarging, or tinting.

3. This experience, as all experiences, should contain some vocational guidance. It is the belief of this writer that vocational guidance, to be successful, does not necessarily have to be positive. If a student spends one hour a day for a school year in a certain field and finds out that it is the kind of work which he does not care to follow, or for which he is not suited, that experience may have saved him from spending several months or years in that field. Surely such negative vocational guidance is worth while. Of course, the most desirable aspect is when the student finds that he is interested in, and capable of, entering some one of the many graphic-arts fields.

Scope of the Graphic-Arts Laboratory

The graphic-arts laboratory may be divided in three major departments: printing, related graphic-arts processes, and photography. These in turn may be redivided into numerous logical subdivisions.

The printing division should contain basic processes and projects in its four basic divisions: composition, imposition, presswork, and bindery.

In the related graphic-arts division, basic processes and projects should be included in the following fields: bookbinding, block printing, etching, thermography, stereotyping, rubber stamp making, papermaking, embossographing, silk screen, and offset.

In the photographic division, basic processes and projects should be included to teach the following: chemistry of photography, composition of a good photograph, contact printing, enlarging and tinting.

This in general should constitute the scope of the graphic-arts laboratory, allow for minor variations in local graphic-arts needs, and for the instructor's particular interests.

The Inclusion of Photography in the Graphic-Arts Laboratory

Some readers will be surprised to see photography included in the outline for a graphic-arts laboratory. Too long has photography been taught in the chemistry department because the chemistry instructor knew how to mix formulas, in the art department because the taking of pictures requires a knowledge of composition, or in some other department because some member had photography as a hobby.

For the past 15 years there has been a tendency to place photography in the graphic-arts field where it has a rightful place. It is one of the basic reproductive arts, and is the ultimate destination of the greatest majority of commercial photography — for use in some printed forms such as posters, advertisements, books, newspapers, etc. The offset field has its basic foundation in photographic principles and procedures.

In 1952 the International Graphic Arts Education Association, realizing these things, placed photography in the graphic-arts laboratory. Since that time more and more schools are including photography in the graphic-arts course.

Summary of the Graphic-Arts Laboratory

If the graphic-arts instructor will develop his course along the graphic-arts laboratory idea, build his instruction processes around the project idea, and open the class to girls as well as boys, the program will be a popular one and the percentage of students taking the course will be limited only by the size of the school.

In order to present a concrete example of how such a program has developed, the writer will outline the development of the graphic-arts program at Tucson High School.

The department was installed in 1940 with a laboratory type experience as its basis. It numbered 80 students and one instructor. With the growth of the school, the popularity of this course has continued to grow until now the department numbers seven instructors, a secretary, stockroom clerk, an enrollment of 650 students a day. The school's total enrollment is 5700.

What were some of the factors which contributed to the building of a department that through the years has attracted an average of 10 per cent of the school's enrollment?

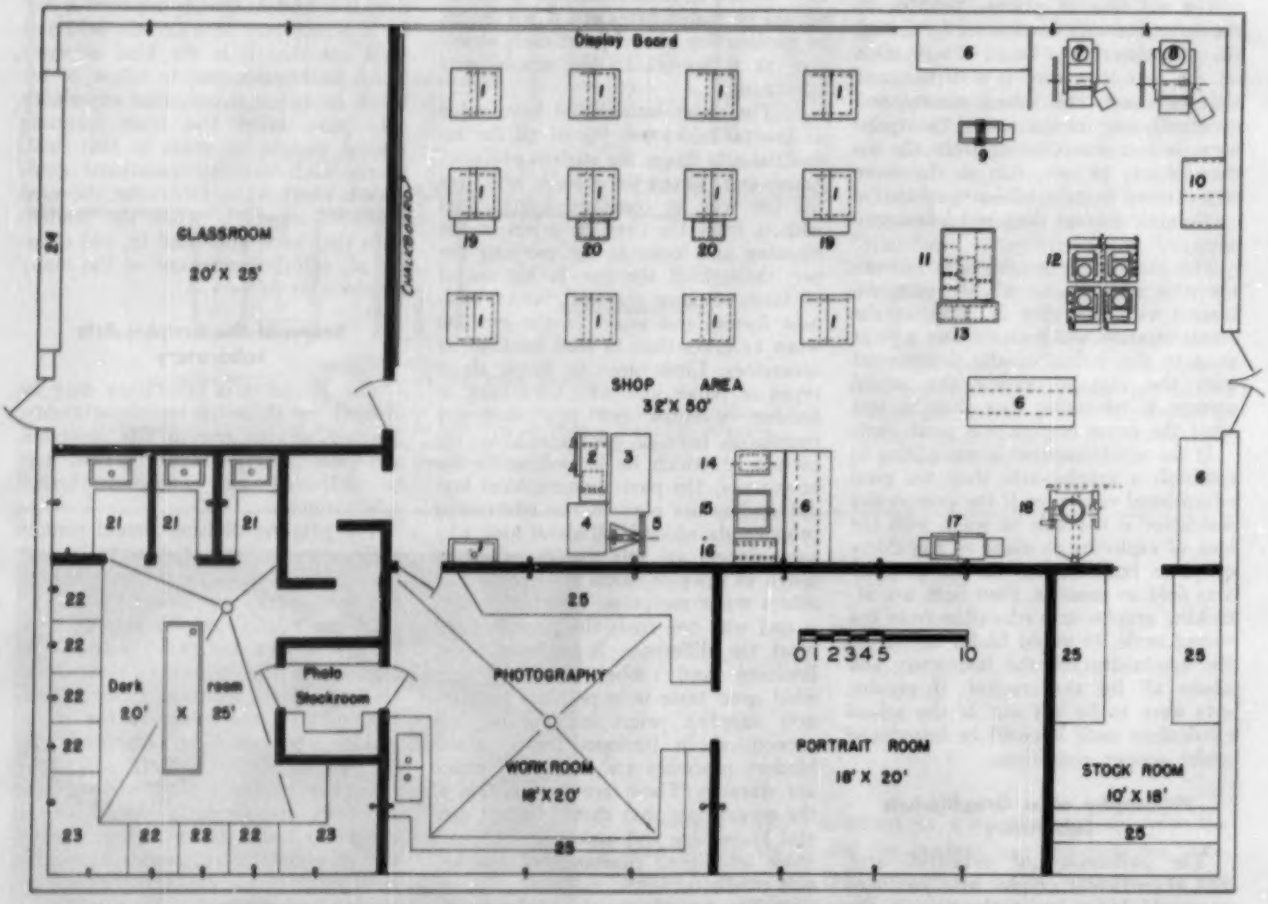
1. It was a laboratory type of experience.

2. It included experiences in as many phases of the graphic-arts industry as possible.

3. The course was open to girls. (The national average of women in the graphic-arts field is about 30 per cent.)

4. The student, during the exploratory year, takes home 10 to 15 projects which are of use to the family.

5. Photography (which last year surpassed philately and numismatics as



Graphic-arts laboratory floor plan. 1. Type cabinets each with 16 type cases; 2. bookbinding unit; 3. stitcher table; 4. rubber stamp press and supply cabinet; 5. stitcher; 6. work tables; 7. 8 by 12 platen press; 8. 10 by 15 platen press; 9. proof press; 10. 2 pressroom cabinets with 14 drying frames; 11. imposition tables; 12. four 6 by 9 lever presses; 13. galley cabinet with 100 6½ by 23-in galleys; 14. Stereotype scorcher; 15. Stereotype caster; 16. Stereotype matrix roller; 17. Varitype; 18. paper cutter; 19. lead and slug rack; 20. galley cabinet with fifty 8½ by 13-in. galleys; 21. film handling darkroom; 22. enlarger or contact printer work stations; 23. general work area; 24. hall and classroom display case and bookcase; 25. photographic workroom work area with cabinets below; 25. stock room for paper supplies.

When the shop develops into a two-teacher situation, a partition can be put from the photographic workroom door to the darkroom door, thus allowing each teacher a show area which will not interfere with the others. The classroom would be used for lecture work by both instructors.

Scale ¼ in. = 1 ft. 0 in. Drawn by Robert L. Dawson, graphic arts department, Tucson High School, from rough sketch by Otis H. Chidester.

America's number one hobby) was included in the course.

If in establishing a graphic-arts unit, or reorganizing a unit already installed, this general outline is followed, the results should be a graphic-arts laboratory in which the student can realize the three major objectives listed above. This contrasts with the print shop installed with the idea of justifying its existence by the amount of job work which can be turned out. In this type of shop usually a limited number of students enroll, and when one becomes proficient in one or two phases of printing, he is kept busy turning out production and thus has little or no time for the broadening experience of exploring the many related graphic-arts fields.

How the interest in graphic arts developed by the graphic-arts laboratory leads to a demand for advanced courses in printing and photography, and how these courses develop the capable students and place many of them in industry in a large area of the surrounding country is not a part of this article, but should furnish further proof of the soundness of the graphic-arts laboratory method, as well as provide encouragement and assistance to those who wish to follow such a course.

Equipment, Tools, and Supplies for Graphic-Arts Laboratory

Following is a basic list of equipment, tools and supplies sufficient for a 24-student shop. The printing section will run from $12,000 to $15,000 depending on choice of selection by the individual instructor and local conditions. The photographic section will run from $3,000 to $4,000.

Composing Room Equipment: 12 16-case, locking, school type, two-station cabinets; 1 imposing table with chase racks, galley storage, furniture storage and storage boards; 2 14-drawer drying racks; 2 cabinets for hand lever presses; 1 pressroom cabinet; 3 metal tables 80 by 36 in.; 2 galley cabinets with 100 8¼ by 13 galleys; 1 quarter case cabinet with assortment of cases; 2 furniture cabinets and contents; 2 reglet cabinets and contents.

Small tools and supplies: 24 6-in. job sticks, 2 8-in. job sticks, 2 12-in. job sticks, 2 15-in. job sticks, 6 12-in. pica gauges, 12 25-em composing rules, 1 sifter and transfer case, 2 numbering machines.

Type and spacing materials: 60 fonts of 10-point type of a basic face such as Garamond, Century, Goudy, etc.; 6 fonts of 10-point italic and 6 fonts of 10-point small caps of the basic face selected; a complete series of Roman type of basic face selected — 6, 8, 10, 12, 14, 18, 24, 30, 36, 48, 60, 72-point; 8, 10, 12, 18, 24, 36, 48-point italic; and 10, 12, 18, 24, 36, 48, 60, 72-point bold. A similar series of type in a sans-serif and squared serifs face for use in poster design; 3 fonts sans-serif wood type in 8, 10, and 12-line; eight series of six different sizes, selected from such faces as Piranesi, Freeland, Canterbury, Tango, Script, Old English, Engravers Text, Gothic for such work as programs, invitations, membership cards, etc.; 6 fonts of typewriter type.

In spacing materials the numbers of fonts indicates both spaces and quads: 6 6-point, 6 8-point, 30 10-point, 6 12-point, 4 14-point, 6 18-point, 6 24-point, 4 30-point, 6 36-point, 4 48-point, 4 60-point, 2 72-point, and 1 font thin spaces in quarter case.

Other typographic accessories: 100 pounds of strip 2-point leads; 100 pounds of strip 6-point slugs; 10 pounds of 2-point hairline strip rule; 10 pounds of 2-point with 1-point face strip rule; 5 pounds 2-point face strip rule; 5 pounds of 2-point light and heavy face; 50 pounds of assorted strip borders; 2 5-pound fonts of 10-point line leaders; one handy pack each of fractions, parentheses, brackets, and 6 handy packs of various decorative ornaments; 6 fonts of monograms; 12 fonts of combination borders; 1 font 12-point tabular quad rule; and 1 font 18-point tabular quad rule.

Press Room Equipment: 1 — 10 by 15 and 1 — 8 by 12 platen press each with variable speed motor, all safety guards, and 6 extra chases; 4 — 6 by 9 lever presses with 12 extra chases; 1 proof press with 14½ by 26-in. bed size; 1 pressroom cabinet; 1 lead and rule cutter; 1 hand miter.

Small tools and supplies: 4 dozen gauge pins, 1 set 8 by 12 gripper fingers; 1 set 10 by 15 gripper fingers, 1 10-in. bellows; 1 plate brush; 1 5-gallon safety gas can; 1 2-quart safety gas can, 3-quart gas cans, 10 gallon oily waste can; 1 type hi gauge, 1 set 8 by 12 expansion roller trucks, 1 set 10 by 15 expansion roller trucks, 1 set extension guides, 2 10 by 16 in. brass galley; 2 dozen galley locks; 3 dozen expansion quoins; 2 quoin keys; 2 ink knives; 1 rawhide mallet, 2 midget planers; 2 type planers; 1 proof planer; 1 set 8 by 12 roller bearers; 1 set 10 by 15 roller bearers; 2 tubes make-ready paste.

Bindery Equipment: 1 26½-in. hand lever paper cutter; 1 bookbinding unit and table; 1 foot-power stapler, 1 adjustable hand punch; 1 automatic electric glue pot, 1 padding press; 1 round corner cutter; 1 set of pressboards; 1 small book press.

Small tools and supplies: 1 book saw, 1 backing hammer, 1 book trimming chisel, 4 book knives, 3 pair shears, 6 bone folders, 2 awls, 1 hand drill, 1 dozen 3/32-in. drills, 1 steel square, 1 package needles, 1 ball linen thread, 10 lb. of flexible bookbinder's glue, 25 yards 1½-in. gummed tape, 10 yards of head banding, 5 yards of backing cloth, 25 sheets binders board, 5

Figs. 1 and 2. Imposition and press work in a graphic-arts laboratory

Figs. 3 and 4. Collation and stitching shop receipt books, and marbling end sheets

— Photographs, Graphic Arts Department, Tucson Senior High School, Tucson, Ariz.

yards each red, green, brown, black, and blue book cloth, 2 quarts cement, 2 dozen 26½-in. cutter sticks, 1 pad counter.

Photographic Equipment, Tools and Supplies: 4 — 4 by 5 news cameras complete with flash, range-finder; 12 — 620 reflex cameras; 35mm. camera, flash and case; 4 light meters and cases; 4 tripods; 2 speed lights; 1 portrait camera; 6 enlargers with 5 in. F:4 lens; 8 — 5 by 7 contact printers; 2 film drying cabinets; 2 — 19 by 25 in. print dryers; 6 easels; 2 print washers; 2 paper trimmers, 1 — 2-burner electric hot plate; 3 sets film developing tanks with light covers; 2 stainless steel trays 12½ by 16 by 2; 2 stainless steel trays 18 by 22 by 6; 1 — 10-quart stainless steel bucket; 1 32-ounce stainless steel graduate; 8 stainless steel ferrotype tins; 4 series 6 lenshades and adapter rings; 2 each of series 6 filters; A, K2, and G; 4 vulcanoid camera cases; 48 — 4 by 5 cut film holders; 48 cut film developing hangers; 48 film clips; 1 dozen stainless steel print tongs; 2 — 5-gallon stainless steel storage tanks; 2 stands for storage tanks; 6 utility safelights, four with red filters and two with green filters; 12 small tinting sets, 1 montage set; 1 retouching set; 1 pair chemical scales; 1 retouching stand; 8 extension lights; 3 portrait spotlights; 3 chemical thermometers; 1-lenshade and adapter ring for 35mm. camera; 1 copying stand and attachment for 35mm. camera; 1 set of filters A, K2, and G for 35mm. camera; 2000 negative envelopes 4⅛ by 6¼ in.; 1 — 2-drawer 4 by 6 steel filing cabinet; chemicals, film, flash bulbs, contact and enlarging paper; textbook, reference books, trade magazines as desired by instructor.

Related Graphic-Arts Processes — Equipment, Tools, and Supplies: Linoleum and wood block carving kit, rubber block carving kit, table stereotype casting outfit, thermagraphy outfit, silk screen unit, heat stamping press, type and supplies, marbling outfit, papermaking kit, cutting rule bender, etching press and supplies, flocking and sparkling equipment and supplies, rubber stamp press and supply kit.

Outline of Course of Study for First Year Graphic Arts

During the first year the student should learn processes and do personal projects which will give him as broad an insight into the graphic-arts field as possible. If after the completion of the first year the student still wishes to explore the graphic-arts field further, the student may be put on school projects which fit into the learning situation. If the student continues in this field, he should be given as much advance work as possible and his experiences should be made vocational in nature, and every effort should be made to interest him in some branch of the graphic arts as a career.

Following is a brief outline of materials which should be covered in the first year graphic-arts course:

History of the Graphic Arts: Development of the alphabet, development of paper, development of the book, development of printing.

The Graphic-Arts Industry: Wide range of opportunities in the graphic-arts field, what the graphic-arts field has to offer, divisions in the graphic-arts field, the place of graphic arts among other industries, salary range in the graphic-arts field.

Printing Processes — Hand Composition: Learning the parts of type, learning the lay of the type case, setting the composing stick, learning the printers system of measurement, learning the spacing system, distinguishing difficult characters, learning to read type, learning to use leads and slugs, classifying type faces, spacing and justifying lines of type, tying type forms, taking proofs, proofreading, making corrections, distributing type forms, setting punctuation marks, justifying full lines of type, spacing optical illusions, setting and spacing capitals, setting paragraph indentations, setting hanging indentations, setting diagonal indentations, setting squared indentations, setting half-diamond indentations, setting poetry indentations, letter spacing, piecing heads and other spacing materials, lining leaders with figures, lining Roman numerals, setting multiple justification, setting rule forms, using proper division of words, using ditto marks, using Italic type, using capitals and small capitals, using sans-serif type, using text type, using script type, using typewriter type, using borders, using initials, using ornamental and illustrative materials.

Imposition and Presswork Processes: Spacing out single forms, spacing out multiple forms, lockup — furniture within furniture method, lockup-chaser method, putting form on press, making press ready, feeding hand lever press, feeding power press, breaking up forms.

Bindery Processes: Figuring stock, cutting stock, caring for printed stock, folding, gathering, stitching, trimming, padding, punching, perforating, wrapping.

Photographic Processes: History of photography, principles of photography, composition of a good picture; basic principles of the chemistry of photography; use of printing out paper; use of developing out paper, use of simple cameras, determining proper exposure, development of film, use of proper grades of contact paper; how to

Fig. 5 (at left) Pulling an etching. Fig. 6. Stereotype unit showing mat scorcher, casting box, and matrix roller

make an enlargement; how to tint a photograph; how to mount an enlargement, how to mix basic formula; the place of photography in the graphic arts.

Block Carving — Wood, Linoleum, Rubber: Tools needed for each kind of block carving, techniques required in each method, cutting simple block, method of registering for color, kinds of paper best suited for each method.

Stereotype Casting: Principle involved in making stereotype reproductions, uses for stereotype castings, methods of making stereotypes, method of making matrix, routing and finishing casts.

Thermagraphy: Principle involved, nature of material used, hot plate method, machine method, effect on inks and papers.

Silk Screen: History, preparing the printing frame, cutting and adhering the stencil, mixing paints or inks, cutting a multi-color stencil, care of printing frame, scope of silk screen process.

Heat Stamping: Nature of process, hand stamping, machine stamping, kinds of metallic foil, scope of heat stamping.

Papermaking: History, kinds of paper, preparing paper pulp, use of the deckle, finishing the sheet, uses of paper.

Die Cutting: Uses of die cutting, determining the shape, making the base, forming the rule, finishing the die, press techniques necessary.

Etching: History, kinds of reproduction, making the etching, reproducing the etching, color etching.

Flocking and Sparkling: Principle envolved, scope of process, materials and equipment used, method of processing and storing.

Rubber Stamp Making: Place in graphic arts, composing form, making mold, vulcanizing rubber, mounting and finishing stamp.

Suggested Projects for Graphic-Arts Processes

Printing: Name card, book plate, memo pad, personal stationery, grocery list, telephone memo, Christmas cards, wall plaque, mailing label, address book, weekly calendar and assignment pad, annual calendar.

Bindery: Pads — padded, perforated and stitched, and padded and punched or drilled, hot pad, autograph album, photographic album, memo pad cover, picture frame, magazine binding, rebinding of books.

Photography: Making contact prints, Christmas cards, enlarging, tinting.

Block Carving: Christmas cards, illustration of personal stationery, illustrative blocks.

Stereotype: Reproducing illustrative materials to be used in conjunction with printing projects.

Thermagraphy: Used in conjunction with printing projects.

Silk Screen: Stationery, Christmas cards, plaques, batik, and putting the designs on wood, metal and glass.

Heat Stamping: Book and album covers, leather gift items, pen and pencil sets.

Marbling: End sheets, edges of books, background for plaques, certificates.

Papermaking: Paper for plaques, etchings, Christmas cards.

Die Cutting: School dance programs, convention lapel tags, file folders, banquet place cards, boxes.

Etching: Etchings, personal stationery, Christmas cards.

Flocking and Sparkling: Christmas cards, school-dance program covers.

Rubber Stamp Making: Name stamp, information stamps.

About 1830, Robert L. Stevens of New Jersey designed the T-rail which is now used in practically all railroad tracks. Originally made of iron, today the manufacture of this product takes well over a million tons of steel annually. — *Steel Facts.*

The wood shop at Eisenhower Senior High School, Norristown, Pa.
Photograph submitted by Mervyn T. Jones, Instructor, Industrial Arts Department

New Vocational-Arts Building at Nebraska State Teachers College

OTTO C. OLSEN
Chairman, Vocational Arts Division

KENNETH F. CARLSON
Assistant Professor of Industrial Arts

WARREN MESSMAN
Assistant Professor of Industrial Arts

DR. FLOYD KRUBECK
Assistant Professor of Industrial Arts
Nebraska State Teachers College
Kearney, Neb.

When the industrial-arts department of Nebraska State Teachers College at Kearney, Neb., moved into its new quarters last September, it was the first time in 40 years that all sections of the department were under one roof. The opportunity was worth waiting for.

The home for the industrial-arts department is one wing of the $770,000 Vocational Arts Building, completed in time for fall semester classes. All industrial-arts shops, classrooms, offices, and storage space are in the separate wing 98 by 262 feet.

Dedication of the building on October 1, with Dr. Verne C. Fryklund, president of Stout State College and former head of the department, as guest speaker culminated planning which stretched back over some 15 years, when preliminary plans were made. Specific planning started about six years ago, and construction began in August, 1953.

Funds for the new building came from Nebraska's 1.1 mill levy on property, which is used for buildings at all state institutions. Above the cost of the building, some $50,000 was spent for new industrial-arts equipment, furnishing an array of new machinery throughout the department.

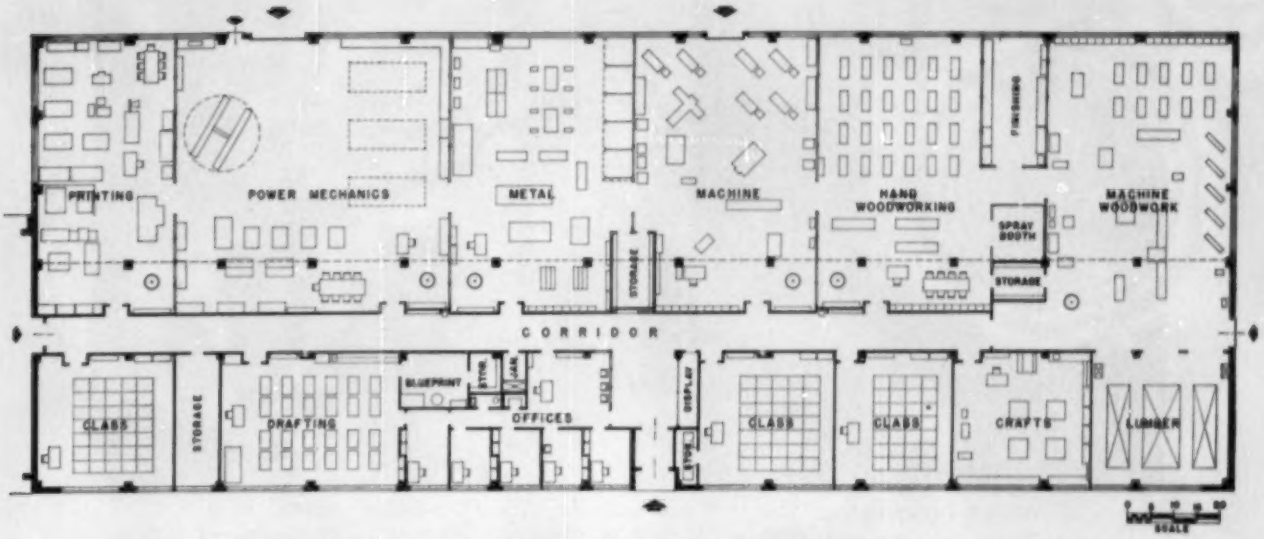
North side of the industrial-arts wing showing three entrances from the street

Experts in the field say Kearney State received more for its money than most schools. Increasing enrollments point toward maximum utilization of new facilities in the very near future. While enrollment at Kearney State for the first semester of the current year was up 37.8 per cent (now 1122 students), industrial-arts students doubled in number. Such a phenomenal rise was not anticipated by the persons planning the new building, but they did take certain steps to insure adequate space for several years ahead.

Several considerations were paramount in the planning of the new industrial-arts facilities. Foremost, of course, was the problem of providing a building large enough for future years, plus the added problem of setting up a graduate program in the near future. Drafting facilities had to be outstanding, also, to accommodate the large number of students taking pre-engineering courses. However, one fact helped facilitate the planning: Kearney State's industrial-arts department is primarily concerned with preparing high school teachers for industrial arts, not vocational education. With the needs of students thus confined, planning was less complicated.

Architectural firm for the building was John Latenser and Sons of Omaha, working closely with Otto C. Olsen, chairman of Kearney State's vocational-arts division, and Assistant Professors Kenneth F. Carlson and Warren Messman. Many of their ideas, gained through long association with high school industrial-arts programs in Nebraska, were incorporated in the building.

Fourth member of the faculty is Dr. Floyd Krubeck, who joined the department last June. He participated in the final phases of organization, and currently is working with the other men in establishing the graduate program. First graduate courses will be offered this summer, but graduate work prob-



Shop unit – Vocational Arts Building, Nebraska State Teachers College, Kearney, Nebr.
– John Latenser & Sons, Architects-Engineers, Omaha, Nebr.

ably won't be a part of the curriculum during regular terms for another year. A program of graduate work is greatly in demand, as no school in Nebraska now offers work beyond the bachelor's degree.

Facilities in the new building are excellent for both undergraduate and graduate work. The industrial-arts wing includes a power mechanics shop 60 by 60 ft.; machine woodworking shop 40 by 68 ft.; print shop 30 by 60 ft.; machine shop 40 by 60 ft.; hand woodworking shop 50 by 60 ft.; including a 14 by 27-ft., finishing room, a 10 by 10-ft. paint spray booth, and an 8 by 12-ft. storage room; a 30 by 30-ft. crafts room; two 30 by 30-ft. and one 26 by 30-ft. classrooms, a 30 by 40-ft. drafting room; 14½ by 11½-ft. blueprint room; a 30 by 30-ft. lumber storage room; five offices, each 9 by 12 ft.; a 16 by 18-ft. reception room and a 13½ by 16-ft. lobby. A storage room for metal supplies is located between the metal and machine shops, a general storage room is between the drafting room and a classroom, and a small room for custodial supplies completes the building.

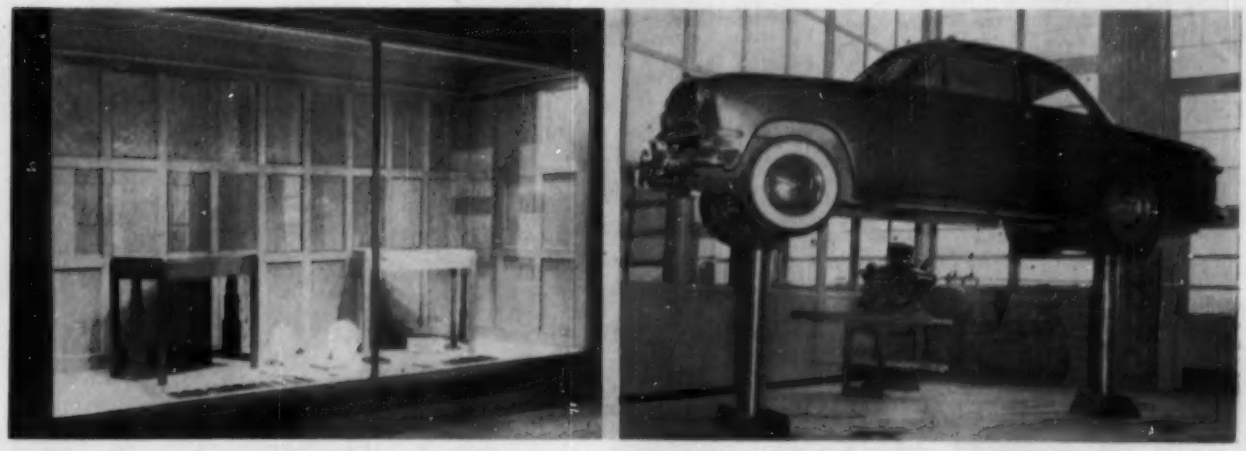
Shop areas are separated from offices and classrooms by an 8-ft. corridor, so classes are not disturbed by shop noise. The corridor ceiling is of acoustic tile, another eliminator of noise from shops and corridor traffic. Motors and exhaust fans are located on the roof, further reducing classroom disturbance and shop noise.

Movable, full-length, industrial type partitions separate the shop areas. Primarily of hammered glass and all-metal framework, the partitions facilitate the natural lighting and allow an instructor to see students in two or more shops.

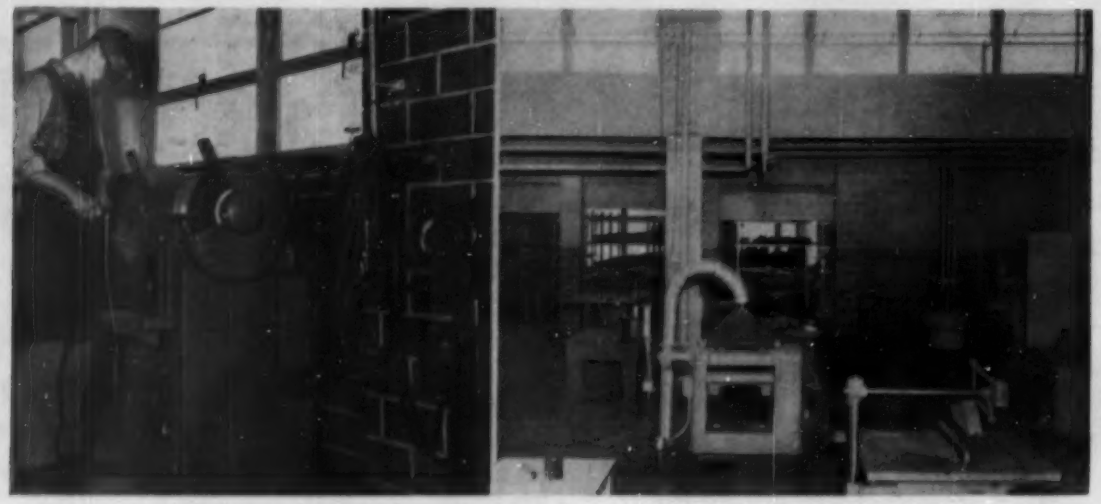
Conduits for electrical wiring are under the concrete floor to eliminate unsightly, exposed wiring. Dust and fumes in the shops are removed by exhaust systems in the floor, except for welding booths and the spray booth, which have overhead fans to remove the fumes. The spray booth is the filter type — incoming air is filtered of dust, outgoing of fumes and overspray.

Other areas were planned as carefully. The drafting room has north lighting on a long side (40 ft.), plus excellent fluorescent lighting, making it one of the best lighted in the country. Drafting desks accommodate 25 students, and a large layout table is provided for special work. A built-in display case for models, a built-in storage cabinet for T squares, as well as other storage cabinets, make the drafting room complete, with no other space needed.

The blueprinting room, now operating



At left, the crafts room with built-in exhibit cabinet; at right, auto hoist in the power-mechanics shop



At left, heavy-duty grinder with dust collector; at right, machine woodworking shop is attached to wood storage — Photographs by R. K. Thorp

with an older machine, will be equipped with the latest machines in the near future. Plans call for facilities for both the wet and the dry processes of printing.

New machinery was installed in the shops before school started in September, with only a few exceptions, and other equipment was set up as it arrived later, so that no inconvenience was experienced.

The woodworking shop was equipped with all new machines: five 13-in. lathes with four-foot gap bed; 14-in. radial saw, 16-in. table saw, 20-in. band saw, 24-in. jig saw, 24-in. surfacer, mortise machine, shaper, and 12-in. jointer. Here the exhaust system collects all dust and shavings at the machines and deposits them in a hopper on the outside of the building, with very little left to be swept into the exhaust openings in the floor.

Metal shop facilities are equally up to date, with heavy-duty grinder, metal spinning lathes, buffers, gas forges, general purpose grinders and five welding booths, complete with canopy and wiring for arc welding. An excellent exhaust system, with a roof-mounted fan and motor to reduce noise, carries fumes from the booths. Two machines, a roller-bearing brake and the slip roll forming machine, purchased some time ago in anticipation of more space, are welcome additions to the variety of sheet-metal tools already on hand.

The machine shop is scheduled for six more lathes, in addition to the milling machine, shaper, vertical and horizontal metal-cutting band saws, 18-in. drill press, carbide tool grinder, and general purpose grinder already in place.

Equipment and machinery in the crafts room are complete now, but more course offerings are planned to include as great a variety as demand indicates a necessity. When plans materialize, course offerings will include work in leather, plastics, art metal, lapidary techniques, and jewelry. The room is ready now for course expansion, with storage cabinets for projects and materials, band saw, jig saw, grinder and four four-way benches to accommodate 16 students.

Scheduled for early attention, equipment-wise, are the power mechanics and print shops. The power mechanics area has already been equipped with a two-post hoist, 8 exhaust openings in the floor, compressor unit, and a new motor donated by a local automobile dealer. While course offerings are not yet listed in the catalog, the addition of new instructors (the first will be added in June), and installation of several motors on portable mounts, plus all necessary tools, are scheduled for the near future. Complete courses in power mechanics are planned when the shop is fully equipped and staffed.

Graphic-arts courses are included in plans for the future. A full program of work in this area has been planned.

No building is better than its conveniences, and the new industrial-arts wing is no exception. In addition to those already mentioned, window glass in the shop areas, display cases and additional storage should be mentioned.

Windows in the shops run nearly the full height of the building, with all except the bottom panes on the east, west, and south being tinted, heat-absorbing, nonglare glass. Shop ceilings (all shops are on the south side of the wing) are higher than on the classroom and office side, permitting use of windows to catch the north lighting.

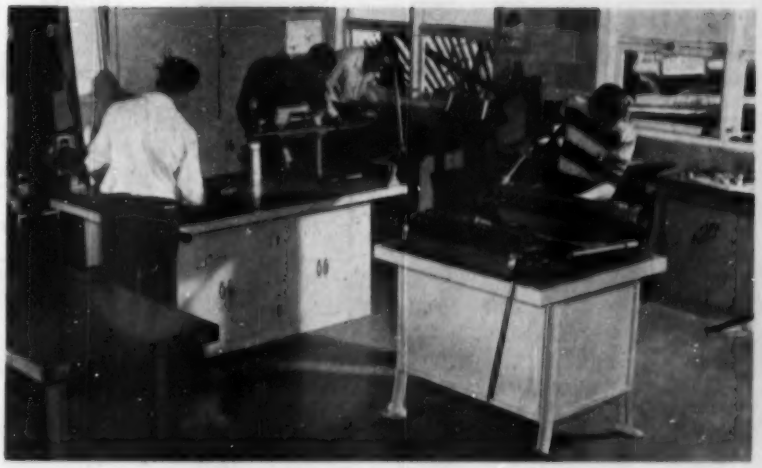
Storage space for materials to supply industrial-arts students is both adequate and convenient. Most impressive is the large 30 by 30-ft. lumber storage room with three metal racks capable of holding more than a carload of lumber, plus special racks for shorts. A smaller storeroom is located between the hand woodworking and power woodworking shops, and a similar storage area is situated between the machine and general metal shops.

Built-in cupboards and tool cabinets have evoked much comment from students and visitors alike, as have the special display cases along the corridor and in the lobby. The lobby case, 4½ by 14 ft., is used for larger projects, while the three small cases in the corridor walls are used to exhibit drawings, small projects and informational material.

South side of the new vocational and industrial arts building

Industrial Arts at the Elk Mound High School

DWIGHT D. CHINNOCK
Supervisor, Student Teaching
Industrial Education Division
Stout State College
Menomonie, Wis.
and
VAN R. CARTWRIGHT
Instructor of Industrial Arts
Elk Mound High School
Elk Mound, Wis.

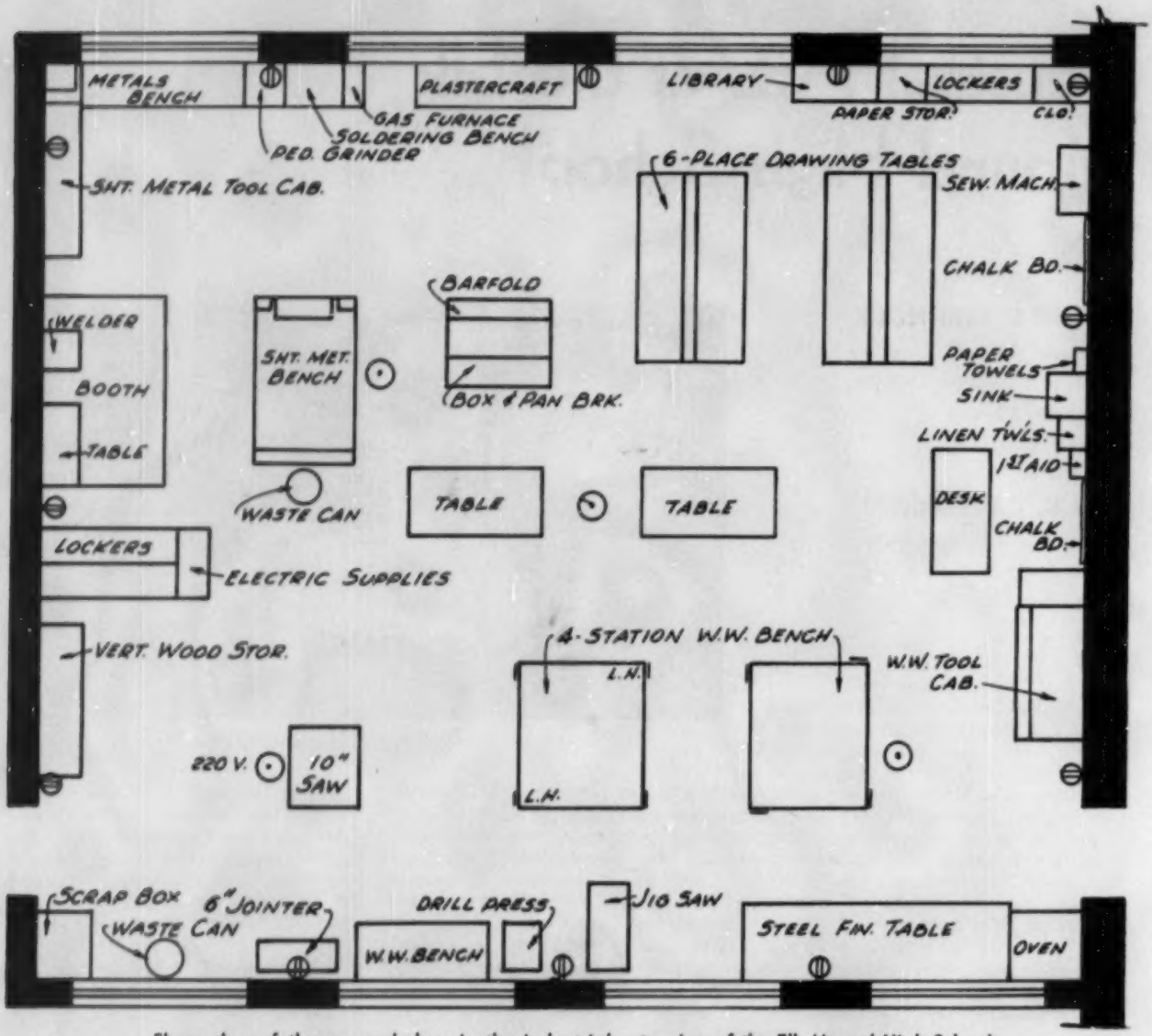


Elk Mound High School sheet-metal shop

The school board and administration of the Elk Mound, Wis., schools have done an excellent job in recent years in meeting the needs of the school and community. Elk Mound has a population of four hundred persons, and is located in the agricultural-dairy area of western Wisconsin, midway between the cities of Menomonie and Eau Claire. An industrial-arts wing with a general shop 34 by 39 ft. was given first priority in the planned building program. The shop has been planned and equipped in order to give to the students in grades eight to twelve inclusive, opportunities to participate in a varied program embracing the basic areas of drawing, woodwork, metalwork, electricity, and general finishing. For boys and girls who are interested in the arts and crafts type of work, courses are offered that give opportunities for choices among areas such as leatherwork, plastics, plaster craft, basketry, metal forming and etching, refinishing techniques, and home mechanics.

During the planning of this shop, it was kept in mind that many of the students are boys from rural areas, and for them course work consisting of units in welding, sheet metal, carpentry, and the like would be of great value. Accessibility to the shop is excellent, because of a delivery door on the west side which enters on a driveway. The student traffic door on the east side enters immediately into a hall leading to

Wood shop and drafting room at Elk Mound High School
— Photographs by Stout State College Audio-Visual Department



Floor plan of the general shop in the industrial arts wing of the Elk Mound High School

several classrooms as well as to the recently completed auditorium-gymnasium. Tools are conveniently located near the areas which they serve. Power outlets were so planned that before the floor was laid, provision had been made for service at strategic parts of the shop, thereby eliminating any extension cords so commonly found in many shops. Service outlets also are conveniently located at intervals in the walls around the shop. A feature of the woodwork area is the arrangement of two vises to make work more convenient and natural for those boys who are left-handed. Two very sturdy drawing tables are located near the shop library. This arrangement also furnishes a planning area which is well situated between the basic wood and metal areas. The fact that the board and administration are alert to the need for educational planning is seen by the rapid building program which has been inaugurated since the completion of the industrial-arts wing. An auditorium-gymnasium has recently been completed, and work is progressing on another wing which will house a new home-economics department, and also furnish four more classrooms.

Elk Mound, located only 12 miles from Menomonie, has for several years been a co-operating school in the development stage of the off-campus student teaching program of Stout State College. With the beginning of the new extended off-campus student teaching program during the coming year, it is anticipated that full use will be made of these excellent general shop facilities as one of the training centers for future industrial-arts teachers.

Nylon, "Dacron," and "Orlon," glamor queens of the oil industry, have been making the papers lately — synthetic papers. Petroleum-based fibers are being used for the first time in paper manufacturing. The new product is three to ten times stronger than ordinary paper made of rags or pulp, and withstands folding 200 times better. The paper is also highly resistant to chemicals, molds, bacteria, and the effects of light. Every day, industry finds new uses for versatile petroleum products like synthetic fibers. — *Petroleum Newsnotes.*

The Morris Township Junior High School

JAMES M. LYNCH, JR.

Principal, Morris Township Junior High School

Morristown, N. J.

The Morris Township, N. J., junior high school was opened in September, 1954, as a successor to the Alfred Vail Junior high school which housed Morris Township's seventh, eighth, and ninth graders for 23 years. It was designed to meet the needs of a suburban community of about 10,000 population. At the time of construction it housed about 300 junior high school students but next year will reach its rated capacity of approximately 450 students.

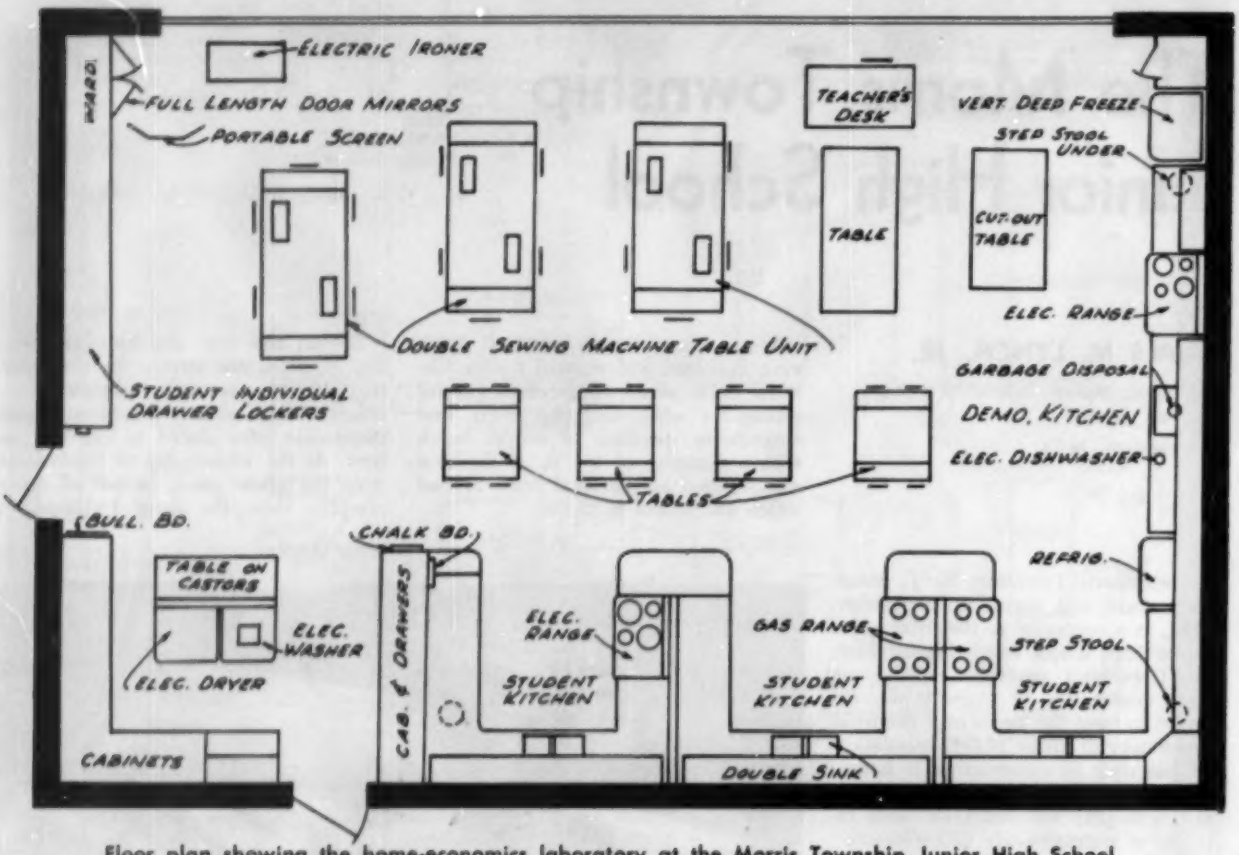
A 32-acre hillcrest site, adjoining the Whippany River, which the board had acquired a year before the final referendum was passed, is ideally suited for the school, especially in a community looking forward to expansion. Formerly occupied by a private estate, the site is in a quiet residential neighborhood, bounded on three sides by undeveloped woodland and centrally located but safe from serious traffic hazards.

Many splendid trees, some of which were imported and planted during Colonial days, afford an excellent natural setting for school and play areas. One magnificent specimen of copper beech with a diameter of 4½ ft. at the base was selected as the focal point around which the school is placed.

Behind this tree and approximately 300 ft. from the street, the one-story central wing, containing administration offices, health suite, library and two classrooms, was placed to run east to west. At the western tip of the central wing the grade starts to fall off quite steeply; there the main 14-classroom

Morris Township Junior High School, Morristown, N. J.
— Kelly & Gruzen, Architects-Engineers, New York

At left, the general shop; at right, home-economics department



Floor plan showing the home-economics laboratory at the Morris Township Junior High School, Morristown, N. J.

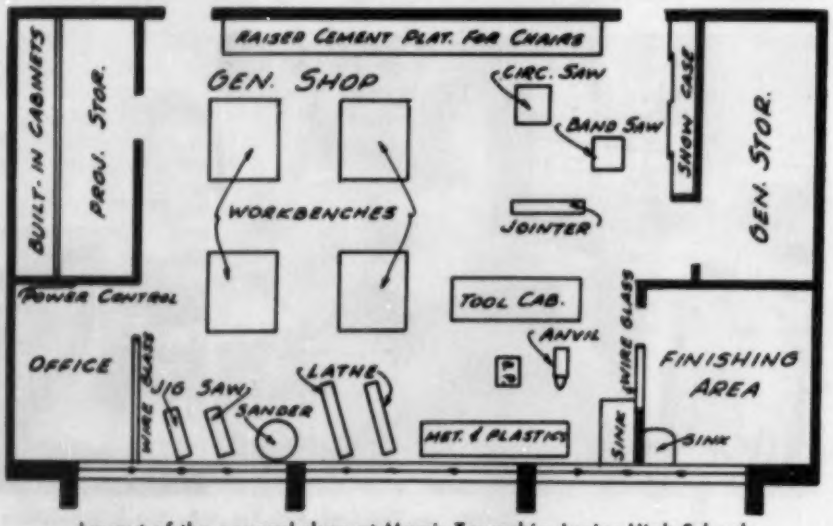
wing was located, turned to the south and running parallel to the slope. The drop in grade was utilized to allow a lower floor, which ordinarily might be basement, to be completely above grade and an upper floor to be kept at a level with the central wing. The lower floor of the wing contains the cafeteria, teachers' lounge, four classrooms, the boiler room, and custodial spaces.

To the rear of the center and east end of the central wing are two more building elements, turned north, which contain the home-economics and science laboratories, shops, music and art rooms, girls' and boys' locker rooms, and the combination auditorium-gymnasium. Thus, all wings have "open" ends for further expansion — with the exception of the south end of the two-story classroom wing where, of course, it is desirable to avoid expansion.

In addition to eliminating costly excavation work by adapting the various building elements to the contours of the site, the plan establishes a compact nucleus for expandability by consuming only 4 acres for the building, roads and parking facilities for 100 cars and 5 acres for the development of play areas, leaving some 23 acres for future use.

The Morris Township Junior High School's program is designed for a school whose student body arrives and departs en masse on school buses. Recreational activities before school and at noon are as normal a part of the day's functions as are the English, history, and mathematics classes.

Except for a schedule of athletics and some dramatics for those boys and girls who wish to take part in an after-school program (and can find a way to get home on their own) all the so-called extracurricular activities are offered within the framework of the school day. Fine and industrial arts, music and science enjoy full status on



Layout of the general shop at Morris Township Junior High School

the regular schedule and an interesting club program is built into the week's work. An exceptional instrumental-music program, topped by a fully instrumented symphonic band, is carried on.

The school at the present time has only two industrial arts rooms. The homemaking room is a combination sewing and cooking room for the use of one instructor. All manner of home appliances are available including washing and drying machines, electric and gas cooking ranges, a refrigerator, an upright freezer, a garbage disposal unit, a dishwasher, both portable and stationary electric sewing machines, built-in cabinets for tote trays, etc.

Mainly for boys, but also used by the girls on occasion, is the general shop. Here, too, there is but one instructor at the present time. Woodworking equipment of a stationary nature such as lathes, and power saw are available. Considerable portable equipment including tools now found in home do-it-yourself shops also abounds.

Construction Details

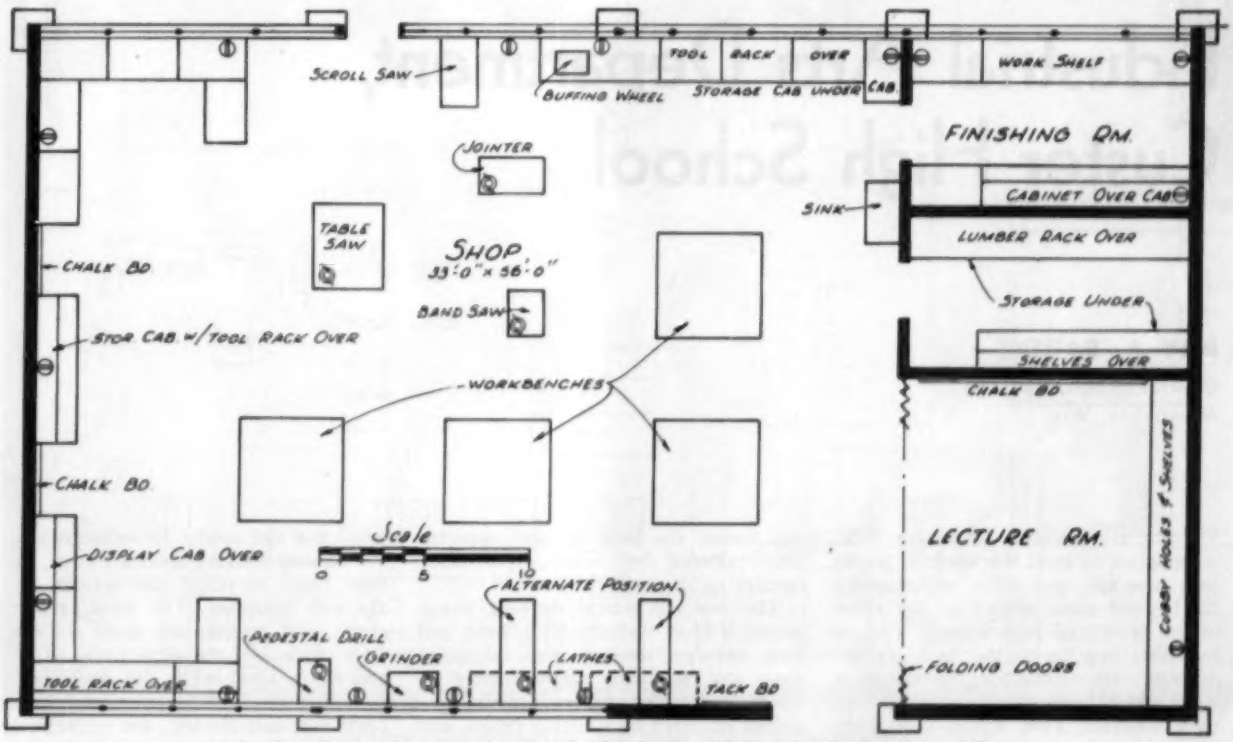
Construction — brick, concrete, steel.
Windows — aluminum sash.
Roofs — insulated.
Ceilings — acoustic tile.
Classroom floors — asphalt tile.
Boilers — steel low pressure, oil burning.
Ventilation — unit, thermostatic control.
Lighting — incandescent, concentric ring.
Communication — electric time clocks, intercommunicating telephones, radio.
Chalk boards — green.
Bulletin boards — cork.
Window shades — Venetian type.
Cost — $975,000 including fees but excluding site.

A Florida School Building

V. C. KNEPPER
Brookside Junior High School
Sarasota, Fla.

In shopwork to a greater extent, perhaps, than in most other subjects, it is essential that the layout and arrangement of the shop space be made with a definite type of instructional program in mind. For this reason we offer the following explanation of the junior high industrial-arts program to serve as a background for any divergences from the usual shop setup.

The shop layout is for use in a school plant designed for 800–1000 pupils of grades 7, 8, and 9. The cost of construction is kept to moderate proportions so far as is consistent with reasonable efficiency. The size of the rooms and the proportions of length to width could be varied while still maintaining the same type of instructional setup. The justification for submission of this plan, if any be needed, lies in the organization of the working space which has been found over a period of years



Woodworking shop at the Brookside Junior High School, Sarasota, Fla.

in a similar shop to be effective for the program being offered.

In the anticipated program to be offered, the shopwork is considered as an integral part of the whole educational program rather than a special subject area divorced from the *academic* subjects. Rather, the shopwork is used as an integrating factor in all the other subject areas, giving life and meaning to many of the studies in other fields.

A brief example will show how the work is planned. About one third of each class group will be taking shopwork at any given time. Let us say that in the science study a need arises for a telescope. Two or three members of the class do the research necessary to learn the essentials of such an instrument. They communicate this information to the two or three who will be doing the actual construction in the shop. When this shop group has completed the telescope, they will explain the procedures by which they produced the finished instrument. As the group presented their plans for the telescope they made out a bill of materials and computed the cost in the mathematics class. In this way, effective motivation gives new life to the other subject areas and the experience in working together for a common good gives extremely valuable experience in citizenship in a democracy.

In order to emphasize the small group divisions the workbenches are extended into the room to set off the various work spaces, as metal, plastics, Keene's cement, or leather. When the call comes for a specific object to be made, it is assigned to the group working with the material used most in the construction. As a further experience in assuming responsibility, most of the tools for each kind of work will be found in racks above the working space where the instructor can easily check up on the effectiveness of the tool checker. Below each bench is space for supplies with each group being held responsible for economical use. In this way each pupil gets valuable experience in learning to *live* with his fellows.

The finish room is located as far as possible from the dust producing areas. The storeroom is near the large double doors, but beyond the assembling area which is used several times a day. Note that this area can be shut off from the rest of the shop easily whenever the instructor needs to have a conference with a part of the class, or it can be used by any who may need to draw plans for work.

This plan of shop not only adapts itself to use with the integrated program, but also provides for recognition of the new 6 billion dollar business which has sprung up largely in the past decade, that is, the *do-it-yourself* movement which has developed rapidly in the past decade until it now is recognized by supply houses as a rapidly expanding market. And since this movement cuts across occupations from the plumber to the doctor, lawyer, entertainer, or millionaire, it must be recognized by every school executive who would train for *living*. And since the junior high school is the last school unit that will have all of the pupils of a community, the implication is evident.

The materials areas suggested here are those which would seem to give a broad contact with the materials used most frequently in this later life period. Ceramics is not included in our own setup because it is offered in the arts and crafts field. If Keene Cement is offered, a second sink or at least faucet should be placed near the rear door.

The window arrangement shown is especially suited to the needs of schools located in the far south. For colder climates, a different arrangement would be needed. Likewise, the outdoor covered passageways or halls would scarcely be adapted to zero weather.

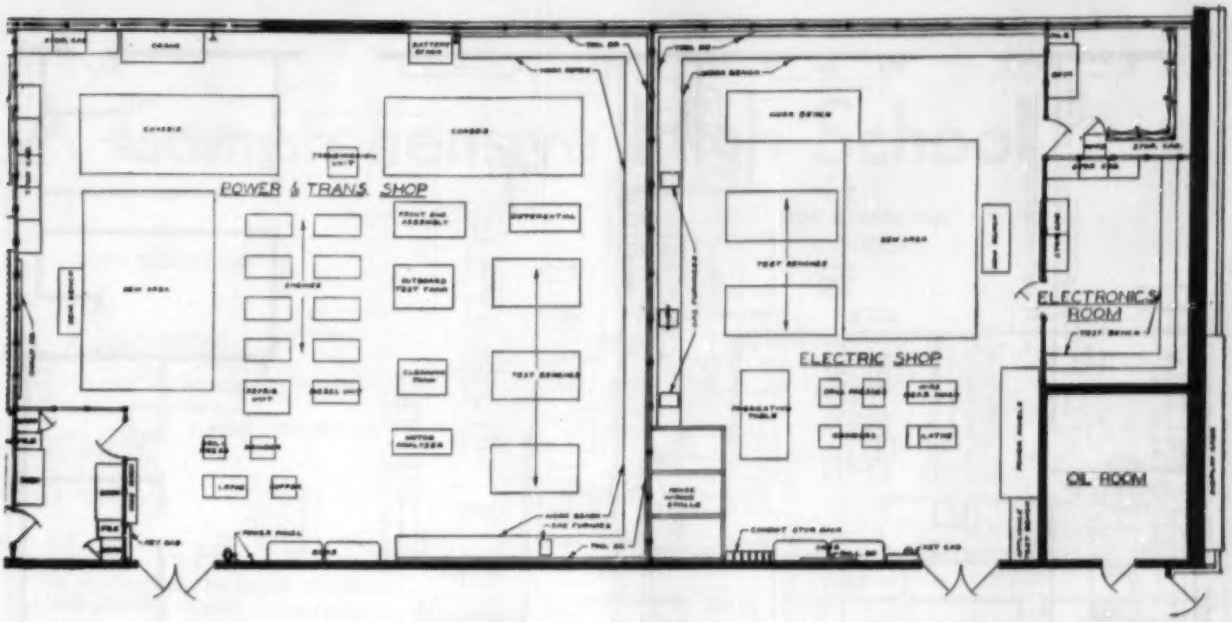
Industrial Arts Department, Custer High School

ROY A. RADTKE
Director of Industrial Arts
Milwaukee, Wis.

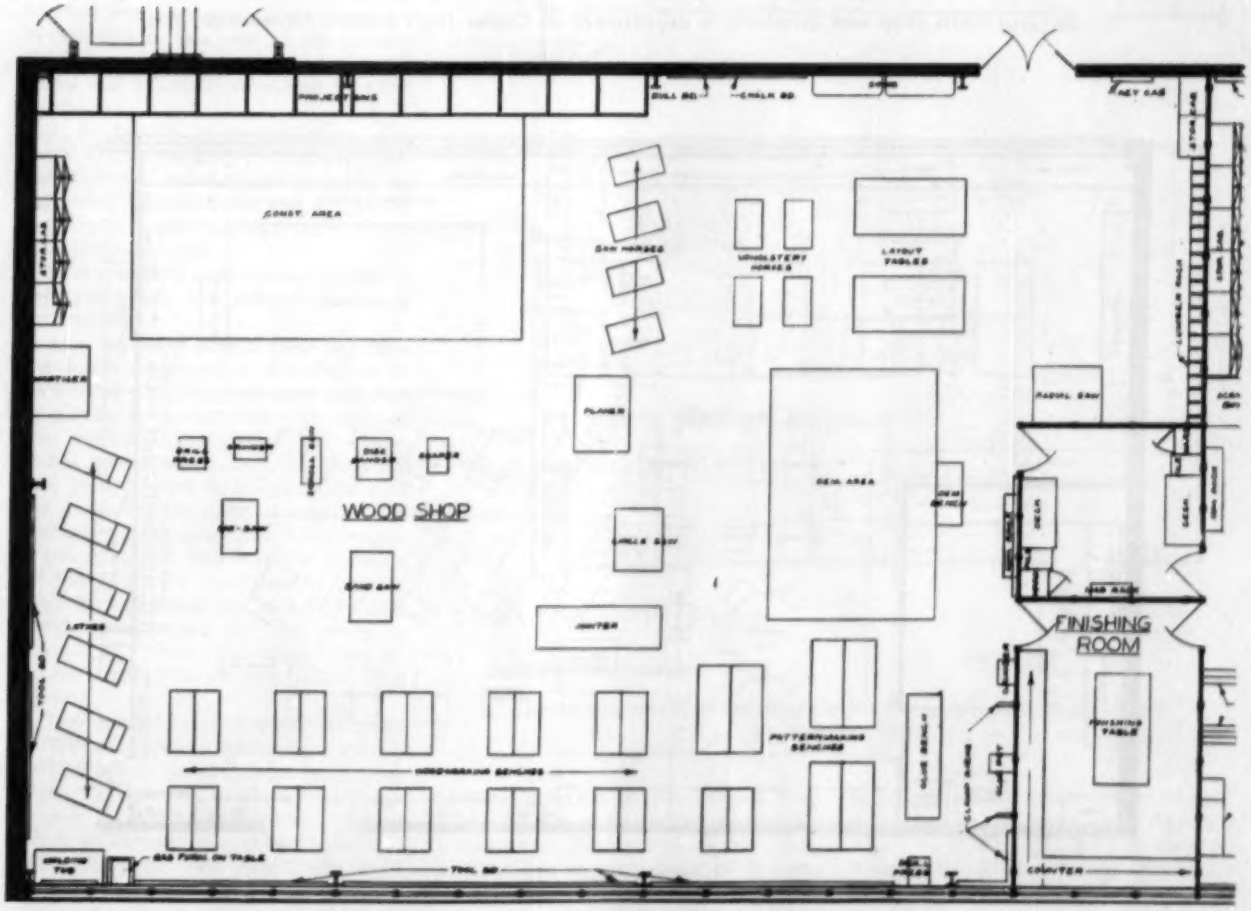
Custer High School, Milwaukee, Wis., is equipped to meet the needs of pupils in a new age, and offers opportunities far beyond those offered in any other of our territorial high schools. Visitors to Milwaukee during the American Industrial Arts Association convention in April should make this a "must see" on their schedule. They will find, in addition to the shops and mechanical drawing rooms, the facilities and opportunities offered by other departments equally as interesting.

The two mechanical drawing rooms are each 25 ft. wide by 50 ft. long, and have between them a small blueprint room and workshop approximately 25 by 25 ft. Besides the two drafting machines mounted on drafting tables, and the blueprinting equipment, there is a scroll saw and sander for modelmaking.

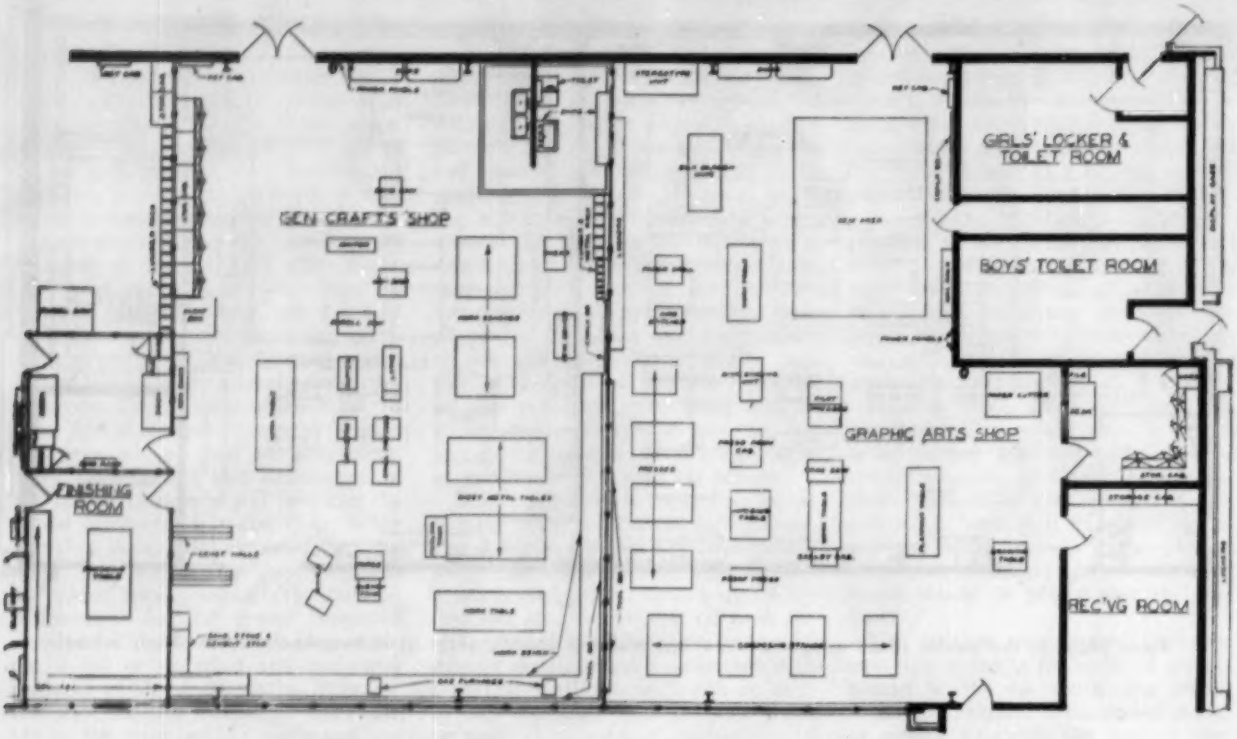
The shop working areas are large, free from beam or pillar obstructions, and are well equipped. The wood, general crafts, and graphic arts areas are each 58 ft. wide, and are respectively 84, 40, and 40 ft. long; while the three shops, including the metal, power and transportation, and electric, are respectively 47 ft. wide and 70, 57, and 35 ft. long.



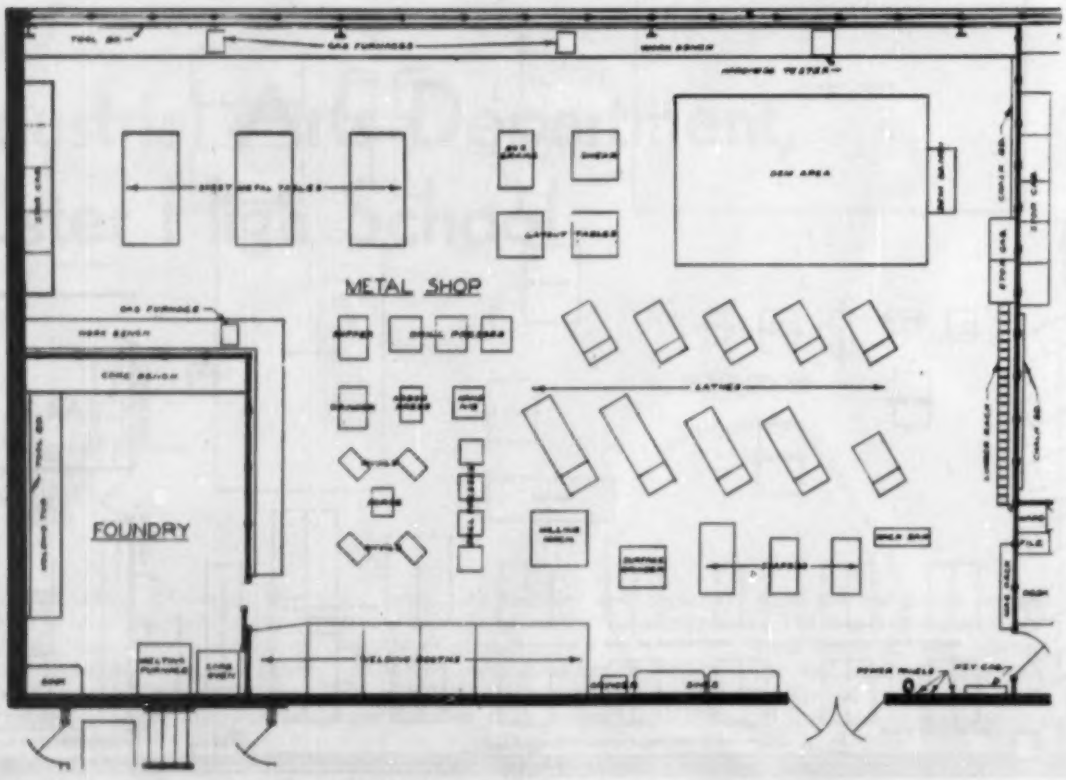
Floor plans of the power and transportation shop, and the electric shop at Milwaukee's Custer High School.



Layout of the woodshop at Custer High School, Milwaukee, Wis.



General crafts shop and graphic-arts department at Custer High School, Milwaukee, Wis.



Layout of the metal shop at Custer High School, Milwaukee, Wis.

A Comprehensive High School

W. K. DUNTON

Co-ordinator of Vocational Education and Industrial Arts

Warren, Ohio

The decision of the board of education to give the highly industrial city of Warren (60,000 population) "the best school shop program in Ohio" was based on three facts:

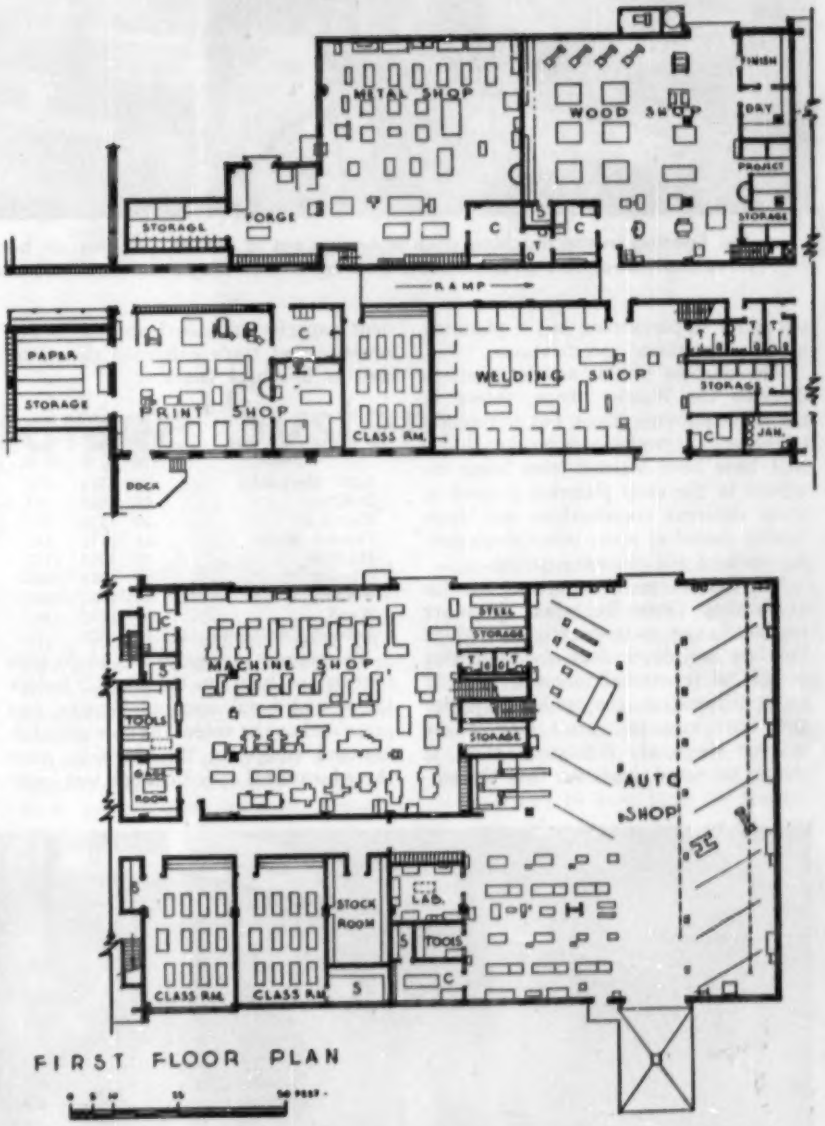
1. A Gallup poll type survey conducted by the Parent-Teacher groups reached every home in Warren and revealed that 67 per cent of the parents wanted an expanded program of vocational and industrial education for *their* children;

2. A formal recommendation was made to the board by a committee representative of industry and labor for an expanded industrial arts and vocational day trade, apprentice and trade extension program; and

3. A complete occupational survey of the community had defined the needs for training.

As a first step toward their objective the board employed a co-ordinator of vocational education and industrial arts to develop in co-operation with the staff and advisory committees the educational specifications for the program, and to determine in co-operation with the architects the costs of construction and equipment necessary for the program. A second step was the inclusion of the $549,923 necessary to provide facilities and equipment in a $5,500,000 bond issue passed by the voters in November, 1953. The issue also included funds for six new junior high shops.

The current trend toward the preparation of complete educational specifications before the architects begin their plans was followed as the soundest approach to good shop planning. In an effort to convert educational specifications effectively into good shop plans, literature in the field was carefully surveyed and countless school shops from Philadelphia to Chicago were visited. A review of the "school shop annual" issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION clearly indicated efforts to plan shops to fit community needs but with equal clarity in many cases showed that the procedure is to make the "shops fit the funds" rather than the "funds fit the shops." Too, visits to many new shops regarding which no articles are ever published revealed that frequently architects are given planning assignments without the benefit of educational specifications or that shop teachers are given little op-



The arrangement of the shops in the Comprehensive High School at Warren, Ohio

The lighting in the machine shop is equivalent to 100-ft. candles at bench height. Machine-shop students have individual sets of basic tools and learn their trade on machines comparable to those used in industry

portunity to participate in the planning of the educational specifications.

The purpose of this article is not to describe the Warren shops, shown in the accompanying plans, but to pass on to readers suggestions concerning things that have been learned from being involved in the shop planning process in three different communities and from having visited so many other shops during each of the planning periods.

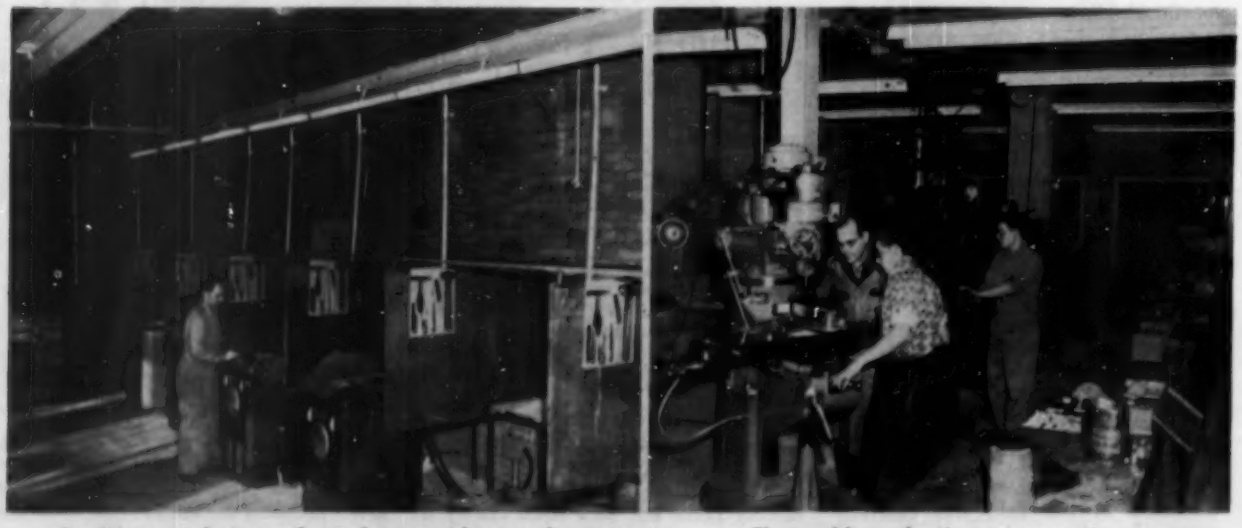
The first suggestion concerns the size of the shop. Generally, school shops are too small, and so frequently in a given building are identical in size indicating a lack of functional planning. Simply as an illustration, the student capacity and floor area in square feet of the Warren shops are indicated below. It should be noted, however, that the student capacity indicated applies to apprentice and trade extension classes as well as in-school youth.

Shop	*Student Capacity*	*Primary Area*	*Auxiliary Area*
Auto Mechanics	22	5264	658
Drafting	28	1888	247
Electrical	20	1220	514
General Metal	25	2177	643
Machine	22	3991	1552
Printing	12	1648	484
Welding	20	1930	1018
Wood	25	2295	1962
Related Classrooms (4)	22	600	50

The second suggestion has to do with "fitting the funds to the shops." Before the school bond issue in Warren was presented to the voters the cost of building and equipping the shops to meet the educational specifications was carefully determined. The amounts required were specified in the presentation to the voters. Again as an illustration the amounts allocated for equipment for each shop are shown below:

Shop	*Cost of New* Equipment*	*Value of Existing Equipment*
Auto Mechanics ..	$ 20,247.60	
Drafting	7,375.00	
Electricity	25,000.00	
General Metal	10,000.00	$18,000
Machine	133,987.35	12,000
Printing	8,000.00	18,000
Welding	9,350.00	5,300
Wood	7,000.00	20,000
Classroom furniture	2,901.54	
	$223,861.49	$73,300

*Does not include freight or installation costs.



Precision work is performed on modern toolroom equipment. The welding shop's twenty stations are equipped with different types and makes of welders

The contract cost of constructing the five new shops and rehabilitating three existing shops was $328,973.

The third suggestion concerns storage space and is based on the problems reported by virtually every shop teacher visited in other cities. It seems that too often the provisions for project, material, and supply storage are both inadequate and inconvenient. It may be noted from the accompanying floor plan that efforts were made to solve these problems by providing individual project lockers for each student, separate storage for night classes, truck access to material storage areas, and by the use of open docks for washing and clothing locker facilities.

As a final suggestion it should be added that outstanding shops can be planned only by the concerted efforts of many people. It is conservatively estimated that the thinking of nearly three hundred people had bearing on the Warren shop plans. The co-ordinator's job was to lead and co-ordinate the thinking of these people.

On the assumption that students of shop planning can interpret the accompanying floor plans without a numerical list of the machines or the inclusion of obvious description, this article will list only the items that deviate sufficiently from the usual to merit special attention.

1. Shop sizes differ according to needs.
2. Auto shop design makes "car stocking" unnecessary.
3. Both floor radiant and space heat are provided in the auto shop.
4. All floors float free from footers, walls, and columns.
5. All shops have conference or planning rooms.
6. All the shops have self-contained toilet and washing facilities.
7. Lighting varies from 50 to 200 foot-lamberts based on task to be performed in the area.

The Warren shops bear out an axiom of shop teachers and supervisors that "you may have a poorer shop program than your superintendent wants, but you cannot have a better one." Paul A. Miller, now head of the schools in Syracuse, N. Y., was superintendent during the planning stage. He was succeeded by Sanford F. Jameson during the construction period. Robert A. Van Auken is assistant superintendent, Milton Mollenkopf is high school principal, and L. O. Wurtemberger and O. A. Lovett business managers. Teachers who participated in the planning are M. C. Bushwack, W. B. Gass, R. C. Hammond, E. J. Keener, W. C. Kelley, K. L. Kraker, G. W. Moore, G. E. Nickel, and T. C. Samuels.

A Project Storage System

OMER K. McCALEB
Industrial Arts Department
David Douglas High School
Portland, Ore.

Project storage always offers a variety of problems to the industrial-arts instructor. A unique locker system designed and built by the author eliminates certain problems, and greatly reduces others.

The particular student locker problems to be discussed in relation to the above-mentioned system are wall space, appearance, maintenance, and project security.

Available wall space was a critical consideration in the situation for which these lockers were designed. Figure 1 shows the area in which the lockers are situated. Number three locker is shown partially extended. Only eight lineal feet of wall space are required to make 96 double lockers accessible.

The appearance of individual-shop lockers is an important consideration in the industrial-arts laboratory. Doors are often held open by boards or projects which are too large for the locker. Hinges may be torn loose by students

Fig. 1. Class locker partially extended. Fig. 2 (at right) Opening the class locker

Fig. 3. Class locker fully extended. At right, Fig. 4. Locking up the locker at the end of the class
— Photographs, R. N. Leppert

who try to close doors on oversized objects. This locker system has no doors although each locker is completely covered and out of sight when not in use. Figure 2 shows the author pulling out locker number five. The oversized object is eliminated from the locker since it would be impossible to close the unit if there was a projection from any opening.

Figure 3 shows locker unit number five fully extended. This unit provides lockers for a class of 24 students. Paper clips secured to each side of every locker provide a convenient storage for such papers as may be used by the students.

Conventional locker systems permit students from one class to molest projects in lockers belonging to students in some other period unless each locker is provided with a lock. The individual lock method is usually a continued aggravation to the instructor. The system illustrated enables one lock to protect the projects of an entire class if the locker is simply closed and locked except during the time that the class is in the shop. Figure 4 shows a closeup of the locking system used. A sliding bolt secured to the locker unit slides into a hole provided in the track above.

The cost of the rolling locker system is somewhat less than that of a stationary, individual door system because there are no doors and hinges to buy, and one lock serves an entire class.

These particular locker frames were built of ½-in. plywood, with ¼-in. plywood for the backs, and 1 by 3-in. stock for the facings. The top, bottom, and shelves are 2 ft. wide, and 8 ft. long, dadoed to hold the vertical dividers. The sides are 2 by 6 ft., and dadoed to hold the horizontal members. The members are locked in place by the back and the facing.

Each locker is mounted on four, 3-in. caster wheels. The wheels are mounted in pairs at either end of the lockers on ½-in. diameter mild steel rod. A straight tracking, free running wheel is important.

Two by four-in. tracks above the lockers keep them in position and guide them in travel. Two short 2 by 4-in. blocks are fastened to each end on top of the lockers, and serve as a guide to keep the lockers on the tracks.

The lockers illustrated have been in use for more than a year, and have met with approval by everyone concerned. Locker systems identical to the one shown here, have been built for both wood and metal shops, and lockers of similar mechanical design, but different size and proportion have been built for two art laboratories.

The compactness, neatness, and security of the rolling locker system appeal to all instructors who have project storage problems.

Week-end crashes accounted for 13,980 killed and 678,000 hurt in 1954.

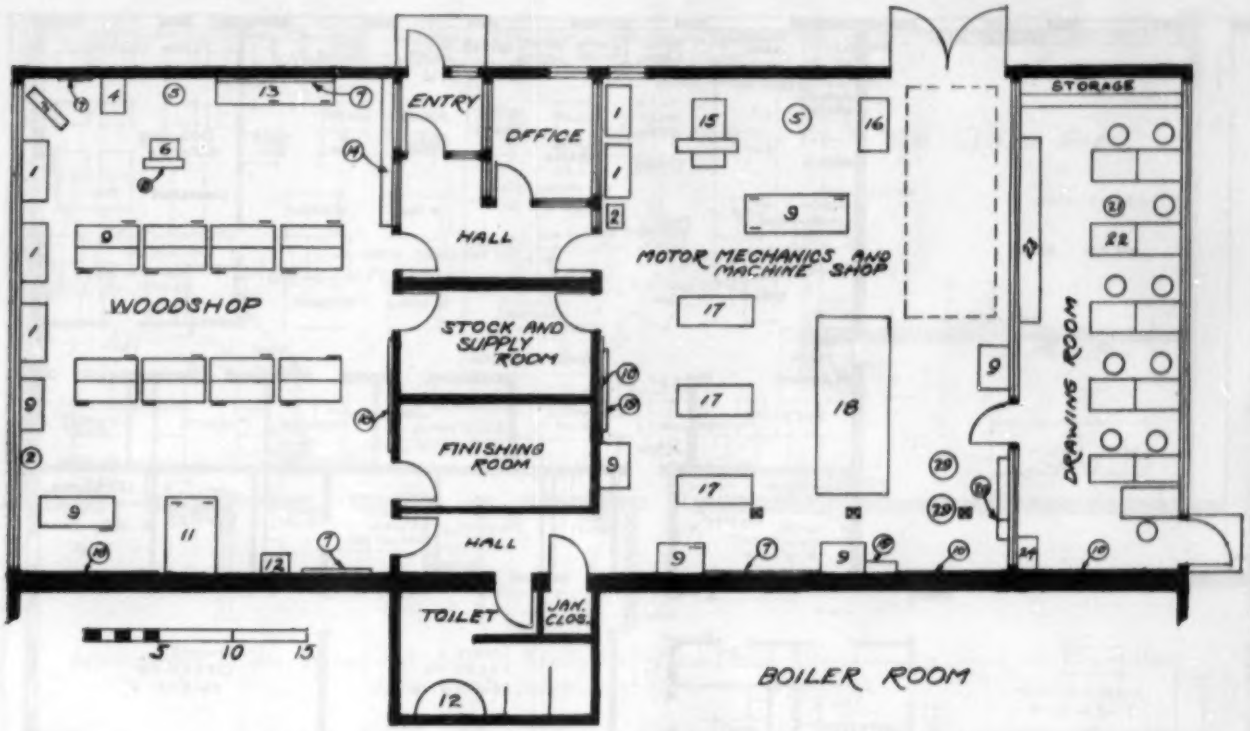
A Mechanical Arts Center

SAMUEL C. BEELER
Director of Mechanical Arts Subjects
Grosse Pointe University School
Grosse Pointe Woods, Mich.

The mechanical-arts center of the Grosse Pointe University School is the result of a planned study by the architect, the headmaster, and the writer. It is a part of a $2,000,000 building program which won the architect recognition by the "School Executive" magazine at the 1954 meeting of the American Association of School Administrators as the best designed school.

The Grosse Pointe University School, formerly the Detroit University School, founded in 1898, is an independent college preparatory school offering instruction from nursery school through the twelfth grade. The objective of the school is not only to prepare its students for college but also to provide experiences, both academic and otherwise, that will enrich and broaden the education of the students.

The mechanical-arts subjects are included as some of these experiences, starting in the fourth grade and continuing through grade twelve. The curriculum of the department includes woodworking, plastics, metalwork, cab-



Layout of the Grosse Pointe University School Mechanical Arts Building

1. Lathe; 2. grinder; 3. jig saw; 4. band saw; 5. drill press; 6. circular saw; 7. tool panel; 8. jointer; 9. bench; 10. chalk and/or tack board; 11. metal workbench; 12. sink; 13. electrical bench; 14. project display shelves; 15. milling machine; 16. metal cut-off saw; 17. internal combustion engines (automobile); 18. automobile chassis (complete); 19. bookcases; 20. battery charger and shelf; 21. stool; 22. drawing table; 23. blueprinting table; 24. filing cabinet; 29. outboard motor; X. flexible hose storage for carbon monoxide gas exhaust release

inetmaking, electricity, machine shop, motor mechanics, and drafting.

Mechanical-arts courses are required in grades four, five, and six, and are elective in grades seven through twelve. In grades nine through twelve the courses are offered to both boys and girls.

As in the academic classes, the mechanical-arts classes are limited in size, usually ten students to a class.

The mechanical-arts center at the Grosse Pointe, Mich., University School

Inasmuch as most of the students attending the school enroll at an early age and continue to graduation a unit type shop experience is provided, so that a student may experience working with a different medium each year and then in the latter years concentrate on one of special interest. In this way a student, at the end of high school, has had the opportunity to take part in a very comprehensive shop program. This is industrial arts in the true sense. The subject is taken for the experience and pleasure it will afford, as a part of the general education of the child and not as a terminal situation often fringing on the vocational.

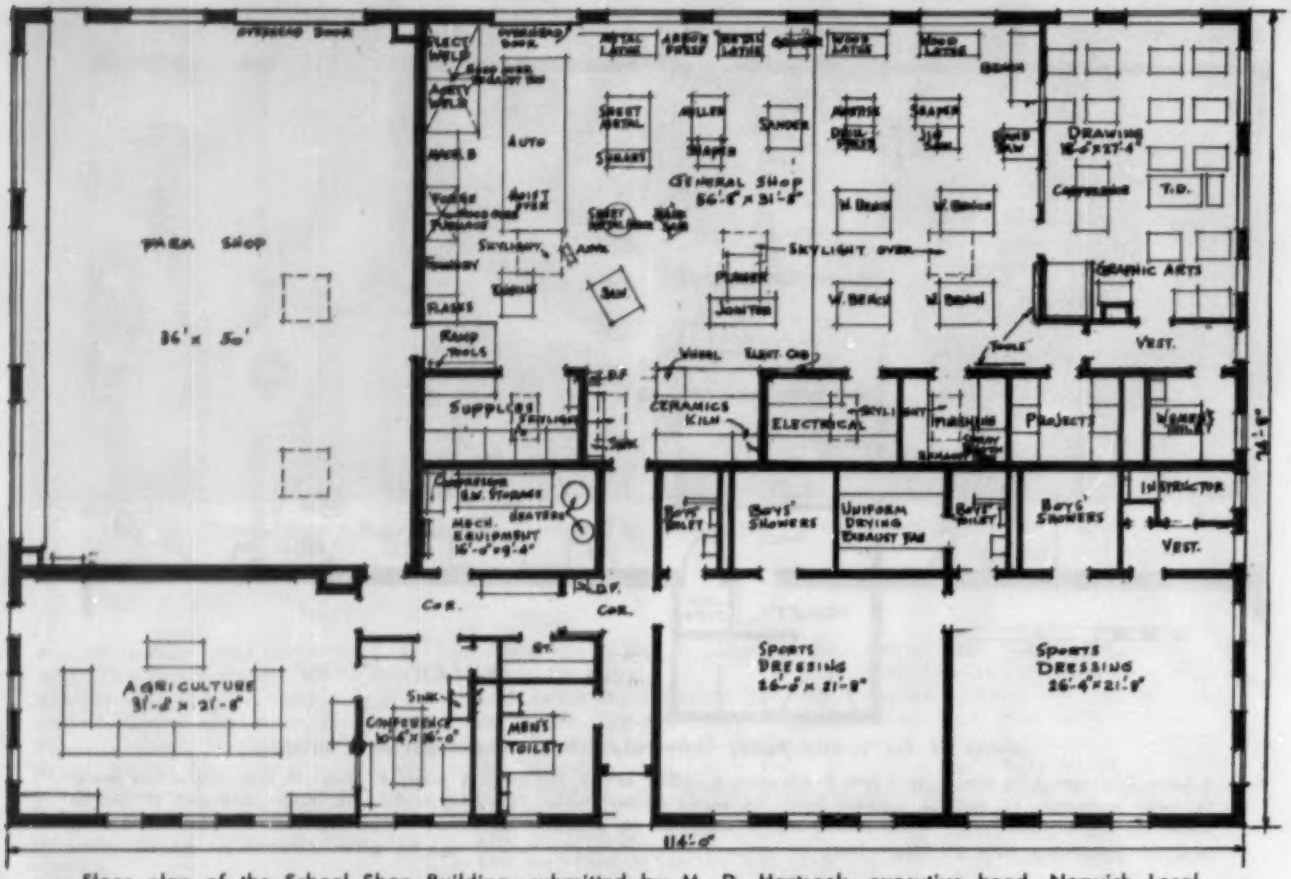
The mechanical-arts center is not attached to the main building, but is a separate building, as are several of the various other divisions as the nursery school and the lower school. They are reached from several points of the main building, providing a more or less campus atmosphere.

The woodshop is equipped to provide instruction in woodwork, plastics, cabinetmaking, and electricity. The mechanics shop to provide instruction in motor mechanics, metalwork, welding, and machine shop; and the drafting room provides facilities for mechanical drawing, blueprint reading, machine and architectural drafting. The drafting room is also used as a planning center and conference room when needed.

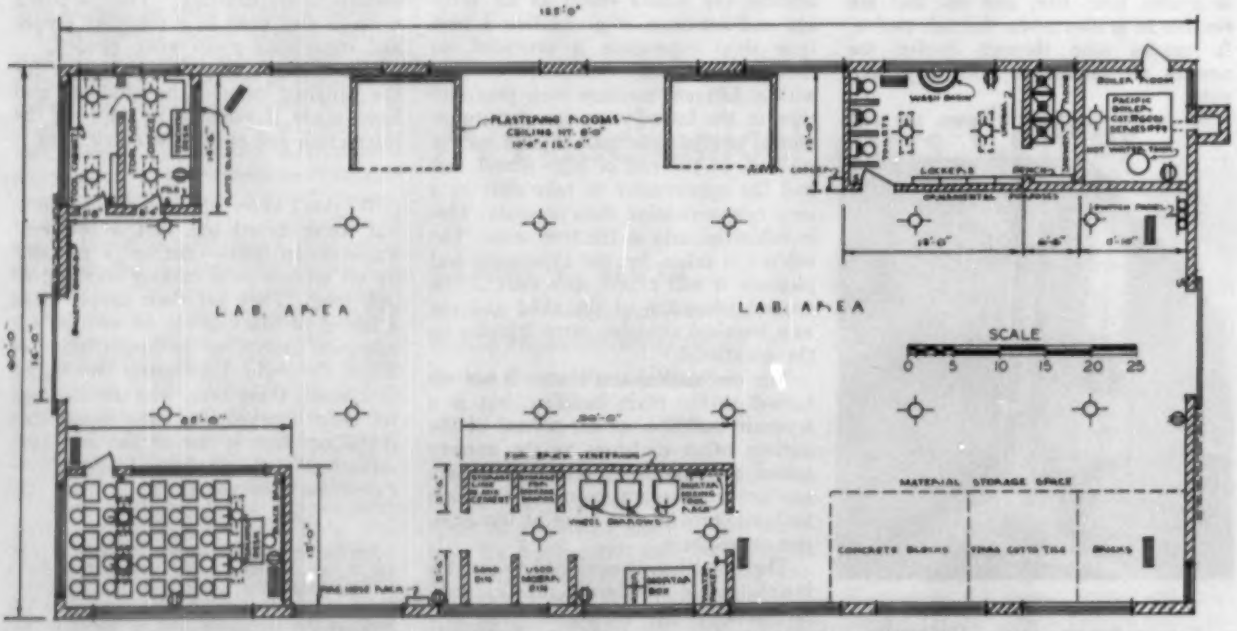
The shops have proved adequate for the program offered the students and have made it possible to improve the instruction and enrich the curriculum.

We don't know who was doing it first, but we've heard tell that a breed of Panamanian bees — not to be outdone by oil refiners — is making wax out of petroleum. They get their supply from a barrel of black crude oil utilized for mosquito control on the jungle island of Barro Colorado. Like many two-legged processors, these bees, who use the wax for their honeycombs, have found that petroleum wax is one of the best preservatives for precious foodstuffs. — *Petroleum Newsnotes.*

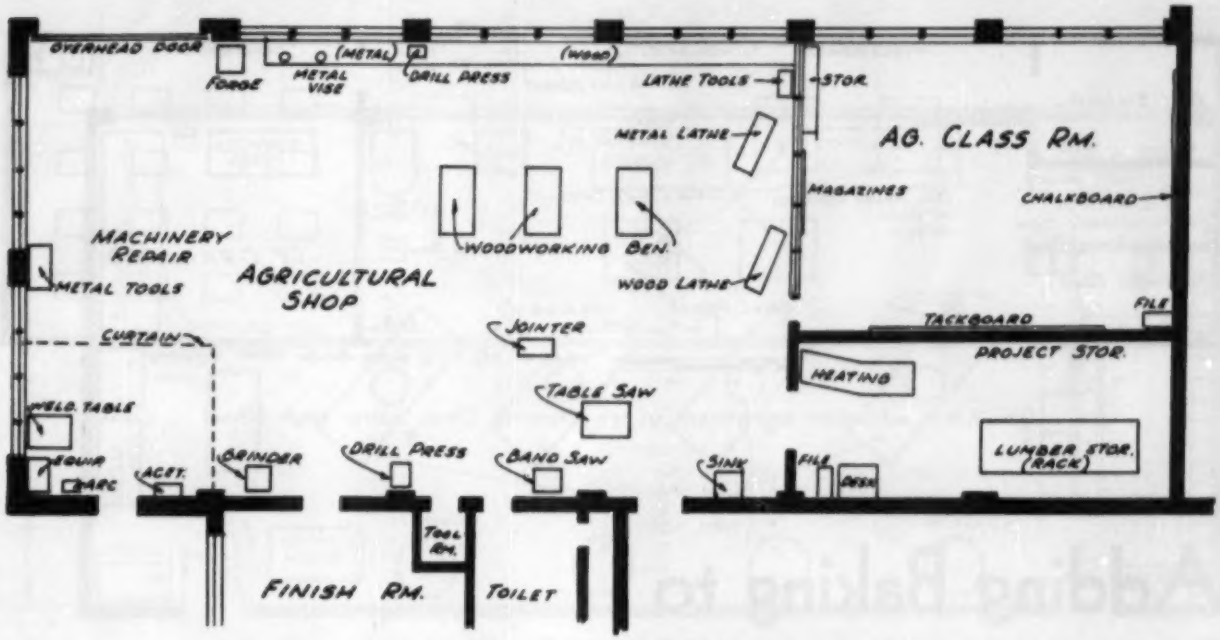
Sanding a rounded surface is easier if you use a half section of old rubber hose as a sanding block. Cut a small piece of sandpaper to fit inside the hose. Shellac applied to the back of the sandpaper and to inside of the hose will hold it tight to the rubber when it dries. — *Shellac Information Bureau.*



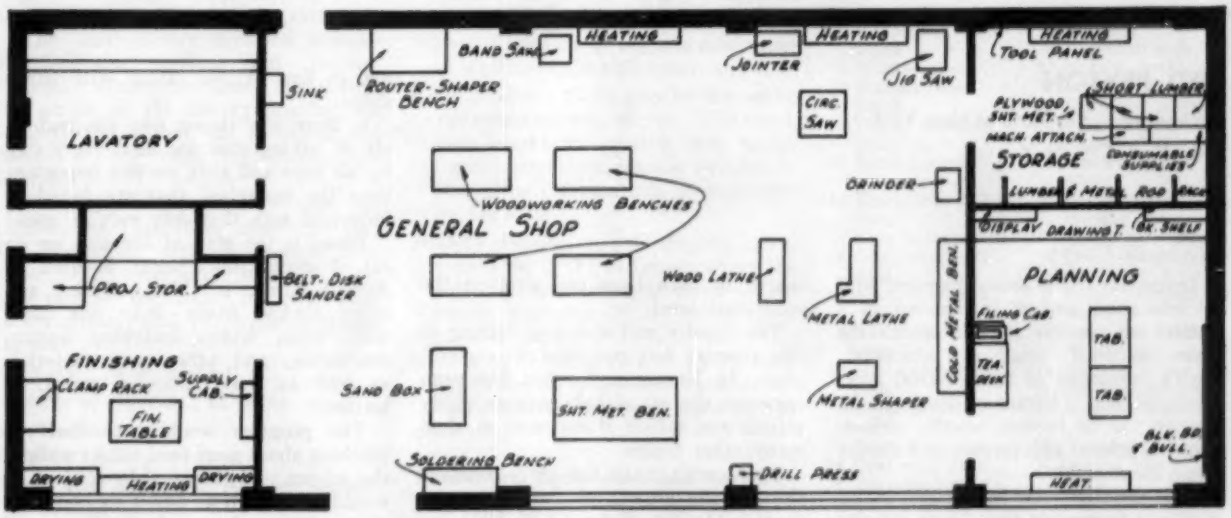
Floor plan of the School Shop Building, submitted by M. D. Hartsook, executive head, Norwich Local School District, Hilliards, Ohio. F. F. Glass, architect, Columbus, Ohio



Masonry shop for a comprehensive high school. Submitted by Withro McEnge, head, department of industrial education, Tuskegee Institute, Tuskegee Institute, Ala. Drawing made by Edward H. Green



Arrangement of the agricultural shop at Spring Grove Joint High School, Spring Grove, Pa. Grant Herr, supervising principal; John M. Humberd, instructor



Plan of the general industrial-arts shop at Spring Grove Joint High School, Spring Grove, Pa.

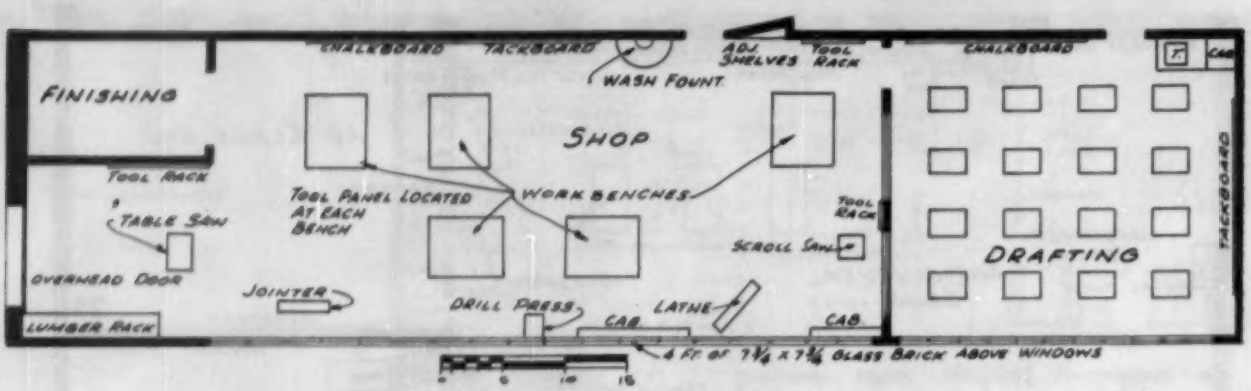
Clarence Olson Junior High School

NELSON N. STORK
Superintendent of Schools
Woodstock, Ill.

The program at Clarence Olson junior high school, Woodstock, Ill., is arranged in such a way that all seventh- and eighth-grade students have vocational or semivocational electives each year in addition to the usual mathematics, language arts, and social studies. Each girl has an opportunity to take one semester each of two of these three fields of art, typing, or home economics. Boys have the choice of art, typing, or industrial arts on the same basis so that they have opportunities in two of the three fields each year. The semester in industrial arts is divided into nine weeks of drafting and a like amount of time for shopwork, largely woodworking with emphasis on hand tools.

(See layout of vocational education department on next page)

If wicker or reed items have become soiled, clean them with a mild soap suds. Allow to dry thoroughly and then apply the thinned shellac. If dirt has become so ingrained that it won't come out with soaping, rub lightly with a fine sandpaper. — *Shellac Information Bureau.*



Vocational education department at the Clarence Olson Junior High School

Adding Baking to Industrial Arts

NED PEYTON
University of the State of New York
New York City, N. Y.

Industrial arts is linked together with all education and is interwoven in a pattern to provide for our youth the seven cardinal aims of education: health, command of fundamental processes, ethical character development, worthy use of leisure, worthy citizenship, vocational adjustment, and worthy home membership.

It is the particular function of industrial arts to provide experiences relative to industry and our industrial society. Through shop and related activities, youth and adults are able to develop skills, knowledge, and attitudes which help them select vocations wisely, to be more intelligent and appreciative as consumers, and to find satisfaction through working with tools and materials.

Industrial arts has completely overlooked the "food trades." A small part of these, cooking, is offered usually to the girls in home economics. Many of the food trades are vocational in nature and as such have no place in industrial arts. Butchering belongs to vocational education. Institution cookery, cafeteria cooking and service, and catering are taught to both boys and girls on the vocational level.

The dignity and status of baking in this country has not held its rightful place. In France and other European countries the art of baking is as highly artistic and skilled, if not more so, than many other trades.

In America since the early nineteen thirties, the growth of the baking industry, the establishment of large industrial food research laboratories, the development of the science of nutrition and the addition of baking and bakery management in college curriculums demands the establishment of appropriate courses on the lower levels of education to provide properly oriented students.

A baking shop can lend itself ideally to a multi-purpose shop, suitable for (1) industrial arts, (2) vocational education, (3) adult education, and (4) trade extension education. There is nothing that can be said for an industrial-arts program whether it be a woodshop, a metal shop, and arts and crafts that cannot also be said for a bake shop.

There is much that can be added in favor of an *industrial-arts bake shop*, not in lieu of, but along with other shops.

Is there any reason why the materials of baking that are used every day by all boys and girls are less important than the materials, that are found in industrial arts, that only *may be* used?

Bread is the staff of life and we do eat it every day. Sugar is used in myriad forms; in cakes, candies, and many cooked foods. Why not flour, milk, eggs, fruits, leavening agents, shortening, and other such materials as well as wood, plastics, metal, or leather?

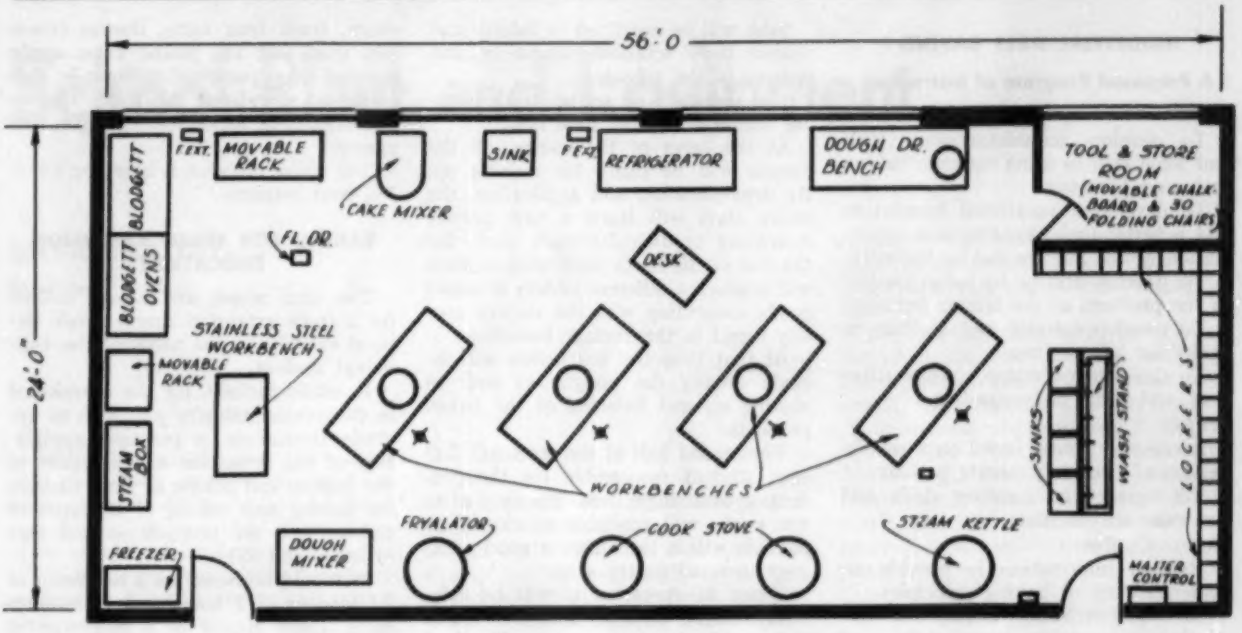
The program would lend itself to teaching about good food habits without the stigma of being a girl's subject. It would also afford an outlet for constructive activity at home whether in a small or large apartment or private home. Whereas the use of tools and other materials, as wood or metals, requires a special work area, baking can be done in any kitchen with the utensils already there.

A Typical Baking Unit for Industrial Arts

Baking Powder Biscuits

The processes and skills are: mixing, kneading, rolling, cutting, panning, and baking.

The student would be exposed to the types, grades, qualities, and characteristics of the following classes of materials directly involved in making baking powder biscuits: flour, sugar, shorten-



Plans for a baking shop

ing, leavening agents, egg and egg products, milk and milk products, salt.

The basic science involved includes the following physical and chemical changes: mixing the batter or dough, the action of the baking powder, the formation of gluten, the functions and effects of the other ingredients, the baking.

The shop shown in the illustration was planned so that it is adaptable for: (1) industrial arts or leisure time classes; (2) vocational students planning to enter the trade; (3) adult education classes; and (4) trade extension classes.

Shop size: 24 by 56 feet.

Number of students: 18 to 24.

Shape: Rectangular.

Height of ceiling: 12 feet.

Floor Area: 75 square feet per student is desired.

Flooring: Area and apron around the gas fired equipment, machinery, and sinks to be of nonskid poured concrete. Remainder of floor to be of No. 2 oak.

Ventilation: Hoods over the cooking equipment and ovens connected to an exhaust fan in the window to conform with local building codes.

Light: Receded daylight fluorescent fixtures to equal or exceed 20 footcandles on all work surfaces.

Electrical Facilities: A master control panel to have individual fuses and switches for each machine. Power safety switches at center of each wall.

Gas: Outlets to be provided where indicated for ovens, steam box, cook stoves, fryalator, and steam kettle.

Water: Facilities for hot and cold water at washstands, dough mixer, and sink.

Color Scheme: Ceiling to be flat white and soundproofed. Walls—Nile green, aisle markings—yellow, fire equipment—bright red, electric switches—blue color combinations as suggested by Du Pont.

Display Facilities: Two display cases, 6 by 4 by 1 ft., to be placed in the hall. Standard movable green chalkboard, and two 30 by 40-in. cork bulletin boards.

Seating to be taken care of by 30 folding chairs on a movable rack, to be stored in the storeroom when not in use.

Machinery, Equipment, and Tool List

1 ½ barrel dough mixer
1 Vertical 30/80 qt. mixer
4 Bench type 12/20 qt. mixers
2 Blodgett shelf ovens
2 Gas stoves
1 Steam jacketed kettle
1 Fryalator
1 24 cu. ft. upright freezer
1 Dough divider
1 Double steam box
1 Steel dough trough
2 Movable racks
1 Steam boiler
1 3-section refrigerator
1 Single compartment sink
1 Double compartment sink
1 Six section washstand
4 Workbenches
1 Stainless steel bench
12 Dozen seamless bun pans
24 Sandwich roll pans
12 Frankfurter roll pans
24 Cake boards
24 7-in. Layer cake pans
36 6-in. Layer cake pans
12 8-in. Layer cake pans
12 9-in. Layer cake pans
6 12-in. Layer cake pans
24 Ring tube pans
24 Oval cake pans
24 Turkshead pans
24 Loaf pans
12 Pound cake pans
24 Cupcake frames
24 Mary Ann frames
24 8-in. pie plates
24 6-in. pie plates
24 4-in. pastry wheels
24 2-in. pastry wheels
36 Frosting knives
36 Bowl knives
3 French knives
3 Slicers
3 Serrated cake knives
12 Bench scrapers
12 Rubber bowl scrapers
2 Floor scrapers
6 Sink brushes
12 Bench brushes
12 Grease brushes
2 Cake fillers
6 Roller dockers
12 Sets fluted cookie cutters
12 Sets plain cookie cutters
24 Ring doughnut cutters
4 Sets animal cutters
4 Sets bridge cutters
4 Sets assorted cutters
1 Bench type can opener
12 Rolling pins
24 Pie pins
12 Hand sieves Nos. 2, 4, and 6 mesh
2 24-in. copper kettles
12 12-in. icing bowls
12 24-in. mixing bowls
12 1-qt. measures
6 2-qt. measures
4 Pie peels
4 Pair oven pads
12 Baker's dough scales
12 Ingredient scoops
3 Fine wire egg whips
3 Medium egg whips
36 Display pans
36 Wooden spoons
3 Heavy wire whips
3 Dough thermometers
3 Sugar thermometers
24 Large rose tubes
24 Flower nails
24 Sets star tubes
24 Sets French tubes
24 Ateco decorating sets
24 Sets plain tubes
24 Canvas bags 12 in.
24 Canvas bags 18 in.
24 Turntables
24 Icing wires
4 Woven wire baskets
2 18-in. Colanders
24 3-foot pieces duck cloth
12 Standard bread boxes
12 Standard roll boxes
24 Heart shaped layer pans
4 Lamb molds
48 Cream roll sticks
48 Tart shells
6 Lattice pie cutters
96 Assorted ice cream molds
12 Wash brushes
24 Icing pots, 5-qt. capacity

INDUSTRIAL ARTS BAKING

A Proposed Program of Instruction

Aim:

To develop acquaintanceship with and some skill in using common baking tools and processes.

To develop a vocational foundation and a better understanding and appreciation of the modern baking industry.

To develop ability to judge quality in the products of the baking industry.

To develop interest and abilities in crafts for leisure time.

To develop leadership, co-operativeness, and social understanding.

Scope:

A one-year course based on a weekly session of two forty-minute periods.

To include the common skills and processes in the trade.

Course Outline:

Related information to provide an understanding of baking principles.

Mixing, benchwork, baking and decorating to provide basic skills and competence.

Machines and materials to be of trade character.

Suggested projects: whole wheat muffins, frosted cup cakes, jelly roll, chocolate pecan brownies, chocolate chip cookies, fruit muffins, sugar cookies, poppy seed twist bread, ring doughnuts, old-fashioned apple pie, old-fashioned layer cake, banana cake, angel cake, coconut cookies.

BAKING FOR VOCATIONAL TRAINING

A Proposed Program of Instruction

Aim:

To provide training in the basic skills and knowledge of the baking industry.

To provide actual shop conditions which offer opportunities to develop proper work habits and attitudes and skills as well as the necessary trade information.

To establish standard achievements that will enable the student to enter the trade as a baker's helper.

Scope:

A three-year course with 50 per cent of the school day devoted to shopwork.

Course Outline:

The shop will be organized as a corporation with shares sold to the students and faculty and applying all the principles found in a well-managed pastry shop.

The students will organize the corporation, elect officers who will appoint the necessary *administrative* and *supervisory* employees.

The class will plan the necessary purchases, production, and sales. They will keep records of inventory, production, orders, and sales.

Sales will be restricted to faculty and student body, school organizations, and visitors to the school.

The shop will be set up and operating within a ten-day time limit.

At the onset of the course, all the doughs will be ready for making up. By demonstration and application, the entire class will learn a new project increasing in difficulty each week. By the end of the tenth week each student will produce a different variety of baked goods, coinciding with the variety usually found in the average bakeshop.

At that time the instruction will include mixing the doughs as well as making up and finishing of the baked products.

The second half of the term will find each student responsible for the production of a single item. The shop after ten weeks will resemble as closely as possible within the limits of good pedagogy, a retail pastry shop.

When in operation it will be relatively simple to add successive terms. Since a heterogeneous group will afford ample opportunity to those at all levels of intelligence and of varying abilities.

The work of the second term will provide experiences of increasing difficulties.

The second year will be identical with the first, with a reorganization based on previous experiences.

The third year: upon successful conclusion of two years in the school shop, a co-operative work study program will be instituted, to expand to the limit the abilities and knowledge of the individual student.

BAKING AS ADULT EDUCATION

Education in homemaking for adults is an important part of any broad public school program developed to meet the needs of the community.

"We are dealing with people of experience who have found wise ways of doing things, and long for wisdom in other phases of living or have glimpsed opportunities through failure and hope for help in fulfillment of that idea." "We may provide a way out of the community into the world." "Not a going out, but an understanding of the wider reaches of the community processes to one in a simple community, so that he feels himself a part of a big world."*

Baking at home would be a course for men and women, who have some experience to bring to it. The students will assemble, mix, and bake a complete project each session.

Suggested projects would include: nestlerode pie, banana cake, cheese cakes, assorted layer cakes, baba au rhum, fresh fruit tarts, Boston cream pie, fruit and nut pound cake, apple streusel cake, pumpkin chiffon pie, old-fashioned strawberry shortcake, Christmas fruit cake, lemon meringue pie, flan pastry.

The above program is based on 15 — 2½-hour sessions.

*Frontiers in Homemaking Education, Elizabeth Riner, Federal Security Agency, Home Economics Education Series, No. 25.

BAKING FOR TRADE EXTENSION EDUCATION

The aim, scope, and course outline for a trade extension course would depend entirely on the needs of the individual student.

It would include, for the semiskilled in the baking industry who wish to upgrade themselves, a practical application of the principles and practices in the making and baking of yeast doughs, the mixing and baking of all types of batters, and the preparation and uses of icings and fillings.

It should be based on a minimum of 25 sessions of 2 hours and 40 minutes each. There should be a minimum of three such terms.

The first term should be limited to the making and baking, the principles and the practices in the handling of yeast doughs.

The second term should be limited to assembling, mixing, and baking all types of batters: white cakes, yellow cakes, foam type cakes, dark cakes.

The third term should include decorating, cookies, pastries, gelatin pies, French pastries, and specialty varieties.

All the courses of study will include at the appropriate time, the related information concerning the materials of the trade.

It is well to remember that we are the product of what we eat. A sound mind cannot long endure without a sound body. An industrial-arts bake shop will provide some of those experiences necessary to provide both a sound mind and nutritionally, a sound body.

If trussed rafters are used in the construction of your new home, you can have your room partitions placed wherever you want them. Or the partitions can be omitted altogether for open planning of such areas as living, dining, cooking, and recreation. With trussed rafters, the interior partitions do not have to help support the roof. It's all done by the rafters and the exterior walls, explains the National Lumber Manufacturers Association.

Tennessee Valley Authority's electric power program has cost taxpayers more than $600 million in federal subsidies. — *U. S. Chamber of Commerce.*

School Plant and Equipment

DAVID PEYTON
Levittown, N. Y.

Behind the school plant there must be a philosophy or point of view. For what purposes do we build and what factors must we consider? What principles should we establish and follow?

The following principles will serve to guide the thinking regarding school plant and equipment.

Principle 1 — School plant must serve the educational program.

Principle 2 — All who will be affected by school plants should have a part in planning them.

Principle 3 — School plants should be continuously evaluated.

Principle 4 — Sites should be centrally located.

Principle 5 — Plants should be of sufficient size to accommodate all pupils.

Principle 6 — Must comply with state, national, and local laws.

Principle 7 — Maintenance and operation costs must be considered.

Principle 8 — Costs must be held to lowest figure consistent with the seven preceding principles.

Quite often staff members who are representative of most grades and departments will be asked to give their opinion on such matters which are closely allied to school plant and equipment.

The problem being practical in nature requires a large degree of competence if the results are to bring about a most efficiently designed plant within the space allotted; however, all members will be required to participate.

Shop teachers in addition to their regular duties as instructors, managers, and disciplinarians, must concern themselves with results in order that they may not be overwhelmed by the amount of work required for the efficient operation of plant.

On the following page is a description of a procedure designed to facilitate a perpetual inventory control suitable not only for the individual department in a vocational school but will be equally effective for an entire secondary school, and with modification may meet the requirements of an entire school district.

The nature of requisitioning, purchasing, distribution, and inventory control deals with time. The nature of a shop teacher makes him more concerned with results than with time. It is not enough to organize activities and procedures in the actual shop class alone, but the time spent by a teacher after he has taught his classes need not become an unpleasant experience either. The annual problem of writing requisitions and keeping tab on disappearing stockpiles of materials takes on the aspects of being a chore and is in danger of being sorely neglected. One piece of machinery aimed at alleviating this situation is an improved method of perpetual inventory control.

If one follows the suggested procedure closely, the accrued results can be gratifying in terms of time and money. Such a procedure will immeasurably increase the effectiveness of teachers saddled with this chore.

What Is This System?

This is a card system, which is color coded for ease of identification of the following classified materials:

I. *Machinery:* Stationary or movable devices usually power driven for cutting, shaping and processing various materials used in the trade, for example, engine lathes, printing presses, kilns, etc.

(See Equipment Inventory cards, front and reverse sides on pages 102 and 103)

Since the number of individual items might number in the hundreds for a given department a systematic procedure for the classification of all such items should follow. All such items should be grouped under individual major headings. These headings were arrived at after a careful observation was made of the supplies, etc., that were used in the program during the normal course of the year. Items are assigned item code letters which are separated from the last four digits by a dash (—), which designate the *material classification.*

The last digit designates the activity for which the item has been adopted. For example: Steel, tool, round, annealed, water hardening, 6 foot lengths, ⅜ in. diameter, approximately .376 lb. to the foot lb. 46 cents. Item AM — 1203. "Am —," In the material breakdown is "Metals and Metal Products": The item number ends with the figure *3*, which shows that it is a vocational item.

Material Classifications

AA — xxxx Brooms, brushes, etc.
AB — xxxx Chemicals
AC — xxxx Cleaning polishing materials and petroleum products
AD — xxxx Cutlery and cutting devices
AE — xxxx Electrical supplies
AF — xxxx Hardware
AG — xxxx Instruments and measuring devices
AH — xxxx Machines and accessories
AL — xxxx Lumber and wood
AM — xxxx Metals and metal products
AP — xxxx Insulating and adhesive materials
AR — xxxx Minerals
AS — xxxx Paints and paint products
AT — xxxx Paper products
AV — xxxx Tools
AW — xxxx Miscellaneous

Activity Classifications

XX — XXX0 Art and mechanical drawing
XX — XXX1 Workshop supplies
XX — XXX2 Items for general use
XX — XXX3 Vocational supplies

No control system has any value unless it is kept in focus so that it presents an accurate and reasonably current picture. The basic failings that undermine the usefulness of a control system are inadequate follow-up and inaccurate follow-up. The arrangement at present utilizes the services of teachers from the department who serve as custodians of the storeroom on a rotation plan. In every case the incoming teacher experiences an adjustment period until he can fully understand the system and adequately serve the needs of the group without being enveloped in a multitude of effort consisting of accepting all supplies, unpacking, checking, posting, sorting, distributing, etc.

II. *Equipment:* Stationary or movable devices not usually power driven to aid in handling, securing, or servicing the work of the trade; for example: workbench, bench shear, miter box, etc. This term is sometimes used to include

ITEM _____ LIST NO. or NON-LIST _____

SIZE & NO. _____ UNITS OF MEAS. _____ SUPPLY BOOK CLASS'N _____

ROOM NO. _____ ROOM FILE NO. _____ DEPT. _____ DEPT. FILE NO. _____ LOC'N _____

MAKER _____ SERIAL NO. _____

SUPPLIER _____ DATE REC'D _____

MOTOR MAKE _____ H. P. _____

MOTOR SERIAL NO. _____ R. P. M. _____

CURRENT—DC-AC-PHASE _____ VOLTS _____

CONTROLLER TYPE _____

MAKER _____ SERIAL NO. _____

ITEMS TO BE LISTED ON THESE CARDS

1 – Any apparatus, equipment or machines having a manufacturer's individual serial number and –

2 – All belt or electrically driven machines with or without serial numbers.

ATTACHMENTS

List below all attachments usable only on this machine and not part of the standing equipment as catalogued. Use other side if necessary.

Accessories and attachments usable on other machines or apparatus are to be listed on supplies inventory card.

Other side of card to be used for record of repairs, replacements and inventory signatures.

_____

_____

_____

_____

_____

_____

_____ SCHOOL

EQUIPMENT INVENTORY CARD

Equipment inventory card – front

DATE	Use this column to enter repairs, replacements and signature at inventory time.	DATE	Use this column to enter repairs, replacements and signature at inventory time.	DATE	Use this column to enter repairs, replacements and signature at inventory time.

Reverse side of equipment inventory card

ITEM BUFF TYPE COTTON FLANNEL NO. WD 52029
SIZE 5" X 30 PLY X 3 ROW UNIT OF MEASURE EACH NO. WM. DIXON CO.
NO. NEWARK, N.J.
DEPARTMENT J-212

EXPLANATION
+ – ADDED — – TAKEN O – NO CHANGE
R – REQUISITION I – INVENTORY T – TRANSFERRED
C – CONSUMED D – DAMAGED F – FOUND
L – LOST W – WORN

DATE	QUAN.	EXPL.	PRICE	S.R. BAL.	DEPT. TOTAL	REMARKS	SHOP DISTRIBUTION 1	2	3	4
9-19-53	50	+R	.44	50	$22.00	FAST WEARING - POOR QUAL-	50			
12-31-53	15	R	.44			ITY. DO NOT REORDER	41			
1-15-54	-9	-C	.44	41	15.40		41			
2-26-54	15	+R	.44	56	20.68		56			

COLOR CODE
WHITE CONSUMABLES
ORANGE TOOLS & LIGHT EQUIPMENT
YELLOW POWERED MACHINERY

ENTRIES
GREEN REQUISITION
RED INVENTORY
BLUE TAKEN IN OR ON HAND

ITEM FILE TYPE BASTARD NO. 87-4256-VOC.
SIZE 10" UNIT OF MEASURE EACH NO.
NO.
DEPARTMENT CERAMICS

EXPLANATION
+ – ADDED — – TAKEN O – NO CHANGE
R – REQUISITION I – INVENTORY T – TRANSFERRED
C – CONSUMED D – DAMAGED F – FOUND
L – LOST W – WORN

DATE	QUAN.	EXPL.	PRICE	CUMULATIVE SHOP DISTRIBUTION 1	2	3	4	5	6	7	8	9	10	S.R. BAL.	DEPT. TOTAL
1/11/53	12	R	.70	2	4									6	8.40
6/6/53	12	+R												12	12
6/7/53	6	-T		2	4									6	12
8/15/53	1	-L		2	3									6	11
9/15/53	2	-W		0	4									5	9
12/15/53	2	-T		2	4									3	9
12/20/53		OI		2	4									3	9
1/11/54	3	R	.75	2	4									3	225
1/15/54	1	-TA												2	8
1/20/54	3	+TW												5	11
1/24/54	1	+F												6	12

Front and reverse side of inventory card

everything but hand tools and materials.

III. *Hand tools:* Small tools of the trade used to process materials or service the work by hand manipulations; for example: chisels, hammers, wrenches, hand shears, etc.

IV. *Materials:* Raw, partial or completely processed supplies, used by the tradesmen in design, construction or servicing; for example: abrasive paper, wire, paint, sheet metal, etc.

How Are These Classified Materials Identified?

By the use of differently colored cards the machinery, equipment, hand tools, and supplies are identified, for example: *Yellow* — all powered machinery; *orange* — equipment and hand tools; *white* — expendable materials (consumables).

All materials considered to be expendable shall be known to have a life span of two years or less: for example: hand file, twist drill, type face, slip, or polishing compound.

What Information Can Be Included on These Cards?

A suitable form which includes all of the information which is necessary to order the various items. On the cards are found the following: *item* — name of item; *type* — description of item; *size* — size of item; *unit of measure* — pound foot each; *number* — item stock or catalog number; *vendor* — vendor's name and address; *location* — by department and room number.

How Are Entries Posted on Cards?

Different colored crayon pencils are used to post all entries, and are identified by the following color code: *blue* — all items taken in or on hand; *green* — all requisitioned items; *red* — all inventoried items.

What Other Information Is Provided for You?

The following legend is found in the heading of the card and explains the disposition of all items; for example:

+ added	the date
— taken	quantity
O no change	explanation
R requisition	price per unit
I inventory	remarks
T transferred	shop distribution
C consumed	stock room balance
D damaged	department total
L lost	
W worn	
F found	

The proposed control system emphasizes that one person on a predetermined schedule of operation can work more closely on the complex and constantly changing problems that are experienced in the areas of requisitioning, purchasing, distributing, and inventory control.

Many more than fifty man-hours were consumed in order to submit requisitions by the system used at the present time. The proposed system will require considerably less time for requisitioning and even less for checking.

What Advantage Can Be Accrued by Adopting This System?

The advantages accrued by the adoption of such a system are as follows:

It can be used to keep accurate records of money spent.

It may be used to advantage when charging students for materials used, since provision is made for showing unit costs each year.

Showing approximate consumption of any item for the previous year, serves as a guide for the quantity to order for the coming year.

Alternate vendors may be listed.

Less time consuming for the teacher.

Does This System Offer Advantages Not Found in Others?

It minimizes labor required for accounting for materials.

It makes possible the issuing of material orderly and quickly.

It helps in maintaining adequate supplies.

It permits for quick checking and inspection.

It permits supplies to be received without interruption of the task at hand, namely, teaching.

Two sets of cards are required. One for the stock room and one for the shop. Both sets can be completed by the teacher in each shop, working in his area of specialization. Cards should be compiled and legibly printed by hand in a most careful manner. This is extremely important, for errors result in a needless waste of time, effort, and money, which will only cause delay and inefficiency of operation.

Specifications should be complete and of such general nature that the items can be ordered from any of the general vendors that supply them. Catalog numbers and brand names in most cases should be omitted from specifications unless the product of a specific manufacturer is needed to satisfy a certain requirement.

A separate card is required for each individual item, for example: every grade of abrasive paper should be on a separate card.

Considerable detail has been used in describing this procedure; it is, therefore, likely to seem a bit involved. However, if the following steps are followed carefully much satisfaction will surely exist as a result of the advantages obtained from its effectiveness.

1. Classify all materials.
2. Transpose all information to cards.
3. Arrange them according to material, activity, and in numerical order.
4. Keep all information, costs, up to date as items are received.

Appreciation is expressed to Anthony Du Praz, Building Construction Chairman, Chelsea Vocational High School Annex, for permission to use the basic card system; Herman Schwartz, Chelsea Vocational High School annex, for technical assistance; Board of Education City of New York, Division of Supply for suggestions on methods of classifying materials.

An Easy Clean-up Plan

CHARLES O. BRUMMER
Industrial Arts Instructor
Jefferson Junior High School
Rocky Ford, Colo.

Here is a cleanup plan that can be used for any kind of shop you may have. It can be used for any size class plus any combination of classes you may have daily.

To construct this cleanup board, you may select ¼-in. plywood or masonite for the backing. After you have laid out and arranged all your classes, not forgetting to leave space for shop duties and students' names, use small hooks or common brads to hold all material that will be put on the board. Next, cut out small tags for all shop duties and make out a name tag for each pupil. These tags can be made from pressed cardboard or a similar material. Titles and grade tags may also be made of this same cardboard. After having laid out the board completely and mounted the hooks in the correct manner, simply hang the tags in the right places as shown in the illustration. The holes in

8th GRADE – WOODWORK CLEANUP PLAN

	SHOP Foreman	SWEEP Benches	CLEAN Lathe Jig Saw	SWEEP Floor	CLEAN Circular Saw	PILE Lumber	CHECK Tools	CLEAN Washstands	CLEAN Drill Press
8-1	NAME TAGS	STUDENT STUDENT	STUDENT	STUDENT STUDENT STUDENT	STUDENT	STUDENT	STUDENT STUDENT	STUDENT	STUDENT STUDENT
8-2	STUDENT	STUDENT	STUDENT	STUDENT STUDENT	STUDENT	STUDENT	STUDENT STUDENT	STUDENT	STUDENT
8-3	STUDENT	STUDENT STUDENT	STUDENT	STUDENT STUDENT	STUDENT	STUDENT	STUDENT STUDENT STUDENT	STUDENT	STUDENT

Cleanup board

the tags can be made with any type of paper punch.

As time goes on, change duties at regular intervals, perhaps weekly. When new classes begin, throw away the old name tags and make new ones.

Some of the advantages of this plan are:

1. It requires little time to construct and maintain.
2. It may be used for any number, kind, or size of classes.
3. It can be used year after year.
4. It can be made of material found in any shop at a low cost.
5. Students take notice and seem to receive much satisfaction from this plan.

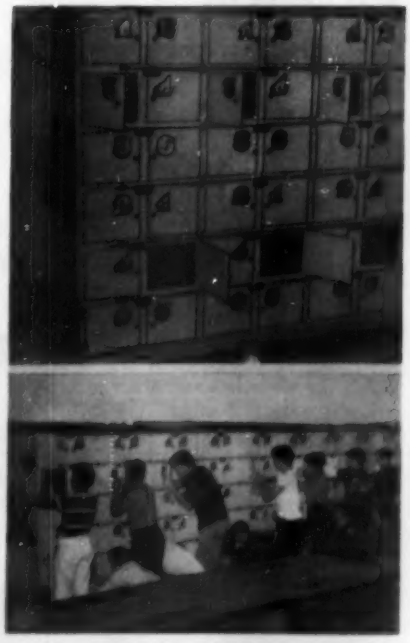
A Planned Project Storage

NEIL HELGELAND
Richland, Wash.

Student project storage is always a problem when starting a new shop or adding a new course. It is one which oftentimes is not satisfactorily resolved because of lack of time, lack of space, or failure to take into consideration all conditions necessary for satisfactory project storage.

A locker system has been developed at the Carmichael Junior High School in Richland, Wash., that has proved very satisfactory. It eliminates all of the shortcomings of student lockers, that this writer knows of at least, and therefore, leaves the mind free of that type of problem.

Now, it happens that, in this shop, very small lockers are adequate. However, the basic principles of this locker system can be applied equally well to most others.



Figs. 1 and 2, showing third period lockers open

The basic problems in designing this locker system were:

1. The usual consideration for space and number to provide.
2. Elimination of congestion at the beginning and the end of the period.
3. Elimination of the *lost* or *forgotten* keys problem that always accompanies the individual lock system. This writer does not agree that combination locks satisfactorily solve this problem; there is too much time lost working the combination, among other ills.

With these ideas in mind the physical planning for this particular shop was started in steps as follows:

1. It was decided to provide lockers for six periods of classes containing a maximum of 24 students each.
2. It was decided that a 12 by 12-in. locker, 20 in. deep would be sufficient. This would necessitate a 6 by 24-ft. wall space.
3. Then, to minimize congestion to the utmost, each student's locker should be as far removed as possible from the nearest student's locker in the same period. This is one of the main features.

This would only be possible by spreading the 24 lockers for each period along the 24 ft. of wall space and further increasing the distance between lockers by providing maximum vertical spread as well. This is done by assigning every other locker in the top row and the alternate one in the fourth row down to one period. Then the alternate ones in the same rows are assigned to another period, etc. This way the absolute maximum in spread is utilized and the students can all use their lockers at the same time if such an occasion arises. See Figures 1 and 2, showing the third period lockers open.

4. To minimize the *lost* or *forgotten* keys problem. It was decided to use as few padlocks as possible by making use of sliding bars with protruding pads to hold the doors closed. By having pairs of doors open away from each other this idea works out very nicely. By welding 12 protruding pads to a ⅜-in. rod which is 23 ft. long, one row of 24 lockers can be secured. Then, by cutting three hasp slots in one of the center pads, one can either lock all 24 lockers or have the 12 with doors opening to the right open, and the other 12 locked or vice versa. One of the center pads is preferable in order to be sure that the lockers farthest from the locking hasp cannot be forced open by twisting the rod — 12 ft. of rod won't twist as easily as 23 ft. This is done by locking the bar in the center so that each protruding pad covers the upper corners of two doors, or by locking the bar in either the left or right position so that the pad covers only the corner of the left door or the corner of the right door of the pair.

This arrangement, then, makes it possible to lock all 144 lockers with only six padlocks. Incidentally, this writer has found no reason for having different types of locks anywhere in the shop; hence, all locks are keyed alike and only one key is needed. Pockets last a lot longer in this way. It also makes it possible to get the maximum spread desired in point three by moving the bar to the right on the top row and to the left on the fourth row down for one period and so on for each of the six periods.

5. Alas! A problem now presents itself — how not to lose the efficiency gained thus far because of confused students who cannot figure out which locker is theirs.

This problem, of course, could be solved in a variety of ways. This instructor chose to devise the rather novel numbering system shown on the lockers in Figure 1.

The numbers are made of fairly heavy gauge aluminum cut in the shape of the numbers 1 through 6, to indicate the period number. These were made rather peculiar in shape in order to have solid metal space large enough to pierce out the individual numbers 1 through 24 within the period number. The numbers, then, are two numbers in one — the large one indicates the period number and the small one the student's number.

Incidentally, these numbers serve well as a piercing exercise for the students, especially those interested in the metalworking merit badge in the Boy Scouts.

Finally, to set these numbers off a little better, a black background was painted on each locker. This was not as much of a job as it would appear. A little time spent making stencils and jigs reduces the actual painting time to an hour or two.

Now, it must be admitted that the development of this locker system took considerable time and planning. In this case, the carpentry work was done by the building contractor. The locking apparatus was built by the instructor with the approval of the administration. The numbering system was largely a class project although, since this is the junior high level, the instructor spent considerable time on it, too.

The question now arises — is it worth it? The answer in this case is an enthusiastic *Yes!* It eliminates congestion, it saves time, it minimizes confusion at the beginning and the end of the period and it eliminates the *lost* or *forgotten* keys problem.

It also serves an intangible purpose. It is the object of much curiosity the first days of school until it is explained. Then it becomes an example, a stimulant and a challenge to the development of more agile minds among the students. These are extremely worthwhile and very important values and sometimes overlooked in the administering and maintaining of an industrial-arts program.

Tool Board for the Lathe

G. A. SPORRE
Sales Training Engineer
South Bend Lathe Works
South Bend, Ind.

There are many ways of storing and dispensing tools in a shop, but the problem is where does the student put them while he is working on the machine. The problem was solved in our Training School Shop by using the tool board illustrated in Figure 1.

The tool board affords a place for the operator to place his tools and also holds the wrenches and other items that are left with the machine at all times. Besides having places for tools and wrenches, a large plastic print folder was fastened to the strap iron upright brackets and this folder is used to hold a lubrication chart and for other printed instructions that pertain to the operation of the machine. Also attached to the upright brackets are two spring type paper clips. These clips are used to hold project prints and operation sheets. See Figure 2.

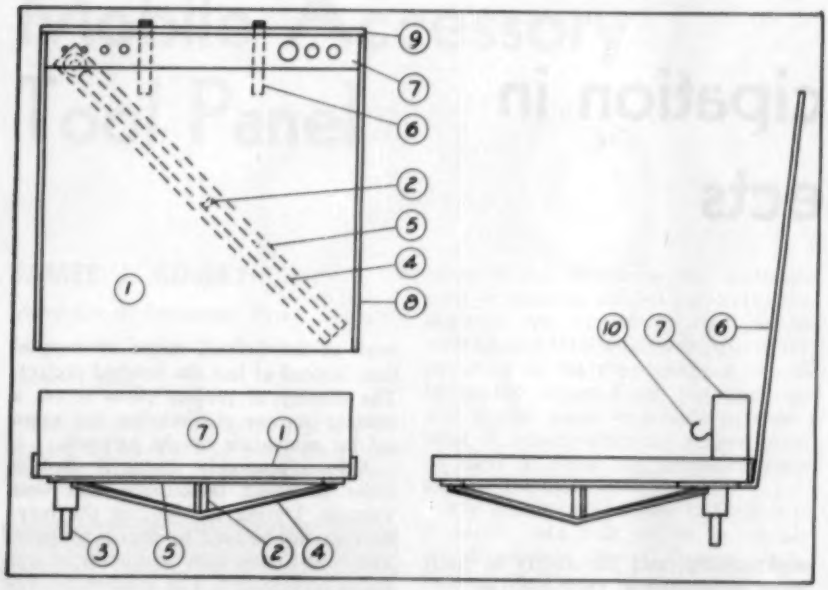
The tool board itself is a good shop project, for there are a number of various operations required in making it. There is lathe work, welding, forming, drilling, surfacing, and woodworking involved in making the tool board. The design for the brackets, Figure 5, and tool board are standard, but the tool holding blocks can be varied to suit the type of machine and amount of equipment left with the machine. See Figures 3 and 4.

LIST OF MATERIALS

Part No.	*No. Req'd.*	*Material*	*Size*
1	1	Plywood	¾ x 16 x 16
2	1	Cold rolled steel	⅛ x ⅝ x 1½
3	1	Cold rolled steel	1¼ dia. x 3 LG
4	1	Cold rolled steel	⅛ x ⅝ x 18
5	1	Cold rolled steel	⅛ x 1½ x 20
6	2	Cold rolled steel	⅛ x ⅝ x 24
7	1	Pine or size and material to suit	2 x 4 x 16
8	2	Pine or material to suit	¾ x 1½ x 16
9	1	Pine or material to suit	¾ x 1½ x 16½
10	2	Opening hooks for knockout bar — 1-in. dia. (For 9 in., Lt. 10 in. and 10 in. — 1-in. CC.)	
11	2	Paper clips (spring type) — 1 in. wide	
12	1	Gear guard bracket (See listing below)	

Brackets (South Bend Lathes)
AS147NK2 Bracket for 9 in. and Lt. 10-in. lathes — $2.65

Fig. 1. Tool board without tools to show arrangement of holes for tools. At right, Fig. 2. Tool board for 13-in. lathes with lathe tools and with drawing



Tool board for the lathe

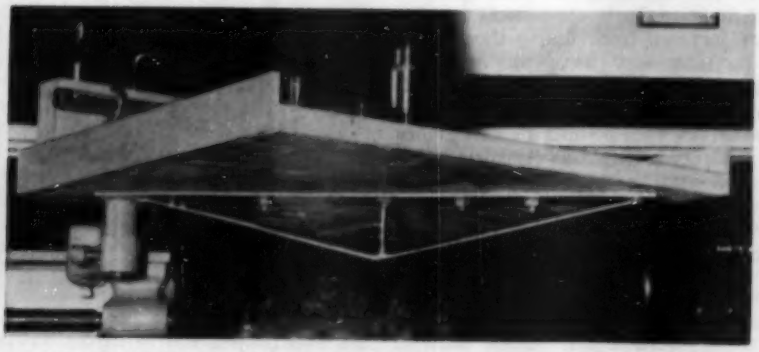


Fig. 5. Underside of the tool board showing support construction

AS147R1	Bracket for 10-in. lathes	$3.70
AS147T1	Bracket for 13-in. lathes	$5.80
PT147F1	Bracket for 14½-in. lathes	$6.30
PT147H1	Bracket for 16-in. lathes	$6.30

The bracket that is used to fasten the tool board to the lathe is a standard gear guard bracket that our company uses on our lathes. Very little has to be done to the bracket before it is placed on the machine. The only thing that should be done is to surface the top where the tool board stud will contact the bracket. This surfacing operation is not absolutely necessary, but makes the board swing easier. When surfacing the bracket, use the tool board stud to check the surface for bearing. A little Prussian blue on the stud will indicate the high spots.

This tool board can also be adapted for use on other machines by making a different holding bracket to fit the particular machine.

(See Figures 3 and 4 on page 108)

The first "heliport" ever constructed in the United States will be paved entirely with asphalt, a petroleum product. The circular airport, built exclusively for helicopters at Fort Eustis, Va., will have asphalt landing strips in the form of an "X" surrounded by a circle. Helicopters capable of carrying 16 to 20 passengers or cargo loads of nearly 9000 pounds may some day be based at the new airport, where petroleum not only will help them land safely, but furnish fuel to power them again into the air. — *Petroleum Newsnotes.*

Thirty-nine per cent of the deaths and 35 per cent of the injuries due to motor vehicle accidents last year occurred on Saturdays and Sundays. — *The Travelers Insurance Companies, Hartford, Conn.*

Fig. 3. Tool board with tools in place. Fig. 4 (at right) Tool board for 9- or 10-in. lathes showing arrangement of lathe tools and parts. See article on pages 106 and 107

Student Participation in Grading Projects

MICHAEL JANKOWSKI
Head, Industrial Arts Department
The Abbey School
Canon City, Colo.

Upgrading and *professional advancement* are terms with which every teacher is quite familiar. We are also familiar with the fact that upgrading or professional advancement results in the raising of our sights. However, in the process of improving our teaching methods we have an unconscious tendency to set up standards that are based upon our own abilities instead of upon student abilities. In order to avoid this fault a democratic system of grading projects has been devised for use in shop classes at the Abbey School in Canon City, Colo., where it has been in successful use for the past two years. Obviously it would be fallacious to claim that this system is a panacea but it has resulted in improvement of student evaluation of their own work, improvement of student planning and workmanship, and the ability to form better judgments of their abilities.

Operation of System

At the beginning of each quarter, each industrial-arts class elects four or more jurymen from among themselves. A juryman may serve for only one quarter and may not be re-elected for another quarter. Such limitations on jury service time permits a good number of students to serve as jurymen sometime during the course of the school year.

One day a week, usually Friday, during the regular class period, all projects as well as project plans are set out on the student benches. Every project must be set out, regardless of whether it is completed or not, thereby allowing for examination and judging of the work in its various stages of completion, instead of just the finished project. The display of project plans serves a twofold purpose of discipline and as an aid for evaluation by the jurymen.

A form purposely simple is used in order to avoid tediousness and time wastage. During the judging the jurymen are not allowed to discuss projects. They must form their own opinions and grade accordingly. The teacher accompanies the jurymen and also evaluates each project. When judging has been completed, the forms are handed in to the teacher who compares the evaluations, averages them, and compares the averages with his own evaluation form. If slight discrepancies occur, the student is given the higher grade. Great differences in evaluation among the jurymen is frequently indicative of juryman prejudices. The *comment* column serves the purpose of giving the teacher an insight into such prejudices which influence the judging. There are times when a juryman will attempt to pad the points for some special friend. Strangely enough, the juryman judging his own project will be harder on himself than one would expect.

A facsimile of the form used is shown below.

A cursory examination of the evaluation form will reveal that the student can earn up to twenty points a week on his project. The eighty remaining points of the one hundred weekly points are apportioned in the following manner:

Attitude	10 points	based on observation
Knowledge	20 points	based on tests
Effort	20 points	based on observation
Quantity	25 points	based on projects and reports
Quality	5 points	based on reports

PROJECT EVALUATION FORM

Date: *Class:* *Juryman:*

Instructions: *1 — poor* *3 — good* *5 — excellent*
Scoring is from 1 to 5 *2 — fair* *4 — very good*

Name	*Project*	*Workmanship*	*Exactness*	*Neatness*	*Finish*	*Comment*
Able, Jim	Book ends	4	3	4		
Bryce, Al.	Tray	1	1	2	1	Not following plans
Bell, Tim	Tie rack	5	5	5	5	

Advantages

Advantages of this system to the teacher: (*a*) provides an aid for evaluating teaching methods being used; (*b*) shows whether certain demonstrations should be repeated and improved; (*c*) indicates what students need special help; (*d*) serves as an indicator of progress in a particular class.

Advantages to the student: (*a*) the jurymen, by scrutinizing each project and seeing it develop, become aware of errors. They try to avoid similar errors in their own work; (*b*) the project owner produces better work because of the competition and the realization that he is being judged by his fellow students; (*c*) the students witness the judging and automatically begin to formulate higher standards to guide them in their own work.

The final advantage is the feeling of *fairness* that permeates the entire class.

Mobile Accessory Tool Panel

JAMES J. KINSEY
Instructor of Industrial Arts
Sunnyside Junior High School
Tucson, Ariz.

Industrial-arts teachers are always looking for ways of improving their program by making their methods more effective and improving the materials used in teaching subject matter to the students. Any new device that can be used to save time without impairing the efficiency of the shop program should be readily accepted and put into use. The mobile panel was built to determine if a more efficient manner could be used to store the accessory tools used on the table saw.

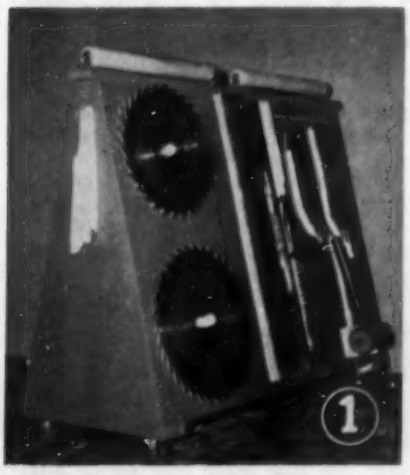


Fig. 1. Front and left end view of mobile panel

The mobile panel shown in Figures 1, 2, and 3, was built in the industrial-arts department, State College of Washington, Pullman, Wash., under the guidance and direction of Dr. W. A. Bakamis, head of the industrial-arts department.

Construction

To determine the methods of construction used in building the mobile panel refer to Figure 4.

The front, back, and two end panels are ¾-in. plywood, glued and screwed to the 2 by 4 *A* frame at each end of the mobile panel. The plywood is rabbeted into the 2 by 4's. The oak strip is secured to the top of the 2 by 4's with 2 — 1½-in. f.h. screws at each end. The metal brackets that hold the rollers are attached to the oak strip. The two end brackets are each secured by 2 — No. 8 by ¾-in. f.h. screws. The *U* bracket in the center is secured with 2 — No. 8 by ¾-in. r.h. screws. The three band steel brackets are made from ⅛ by 1-in. band steel, and are drilled to fit the metal studs that protrude from each end of the hardwood rollers.

The rollers are lawn mower rollers that can be bought in a hardware store. The rollers are sold in varying lengths

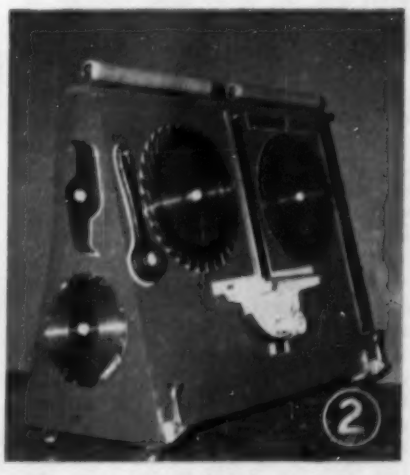
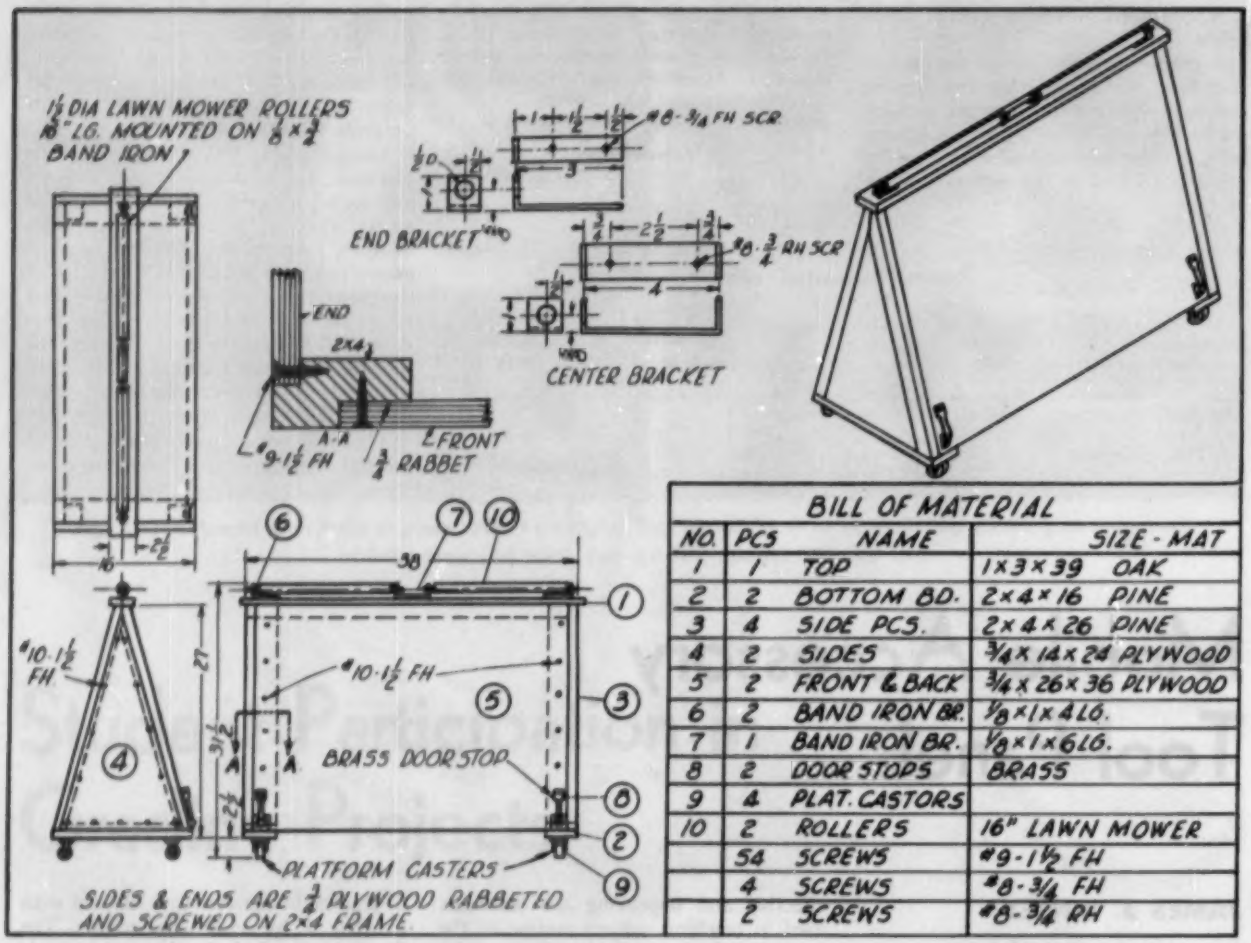


Fig. 2. Back and right end view of mobile panel



BILL OF MATERIAL			
NO.	PCS	NAME	SIZE - MAT
1	1	TOP	1×3×39 OAK
2	2	BOTTOM BD.	2×4×16 PINE
3	4	SIDE PCS.	2×4×26 PINE
4	2	SIDES	¾×14×24 PLYWOOD
5	2	FRONT & BACK	¾×26×36 PLYWOOD
6	2	BAND IRON BR.	⅛×1×4 LG.
7	1	BAND IRON BR.	⅛×1×6 LG.
8	2	DOOR STOPS	BRASS
9	4	PLAT. CASTORS	
10	2	ROLLERS	16" LAWN MOWER
	54	SCREWS	#9-1½ FH
	4	SCREWS	#8-¾ FH
	2	SCREWS	#8-¾ RH

Fig. 4. Mobile panel for storing accessory table saw tools

and a suitable length can be selected by the instructor to fit the purpose for which it is to be used. The rollers would make an ideal lathe project for a student. They could be turned from hardwood and the metal studs inserted in each end to hold the rollers in the metal brackets on top of the mobile panel.

The mobile panel is supported on platform casters that allow the panel to be moved in any direction. The platform casters make the panel easy to roll to one side of the table saw when not in use, or to roll into position to support long lengths of material that are being ripped on the table saw. The size of the platform casters and the type of material the wheels are made from will depend upon the type of floor the mobile panel will be used on. Small wheels do not roll satisfactorily on a rough floor. The height of the platform casters will depend upon the overall height of the mobile panel. The total height of the panel should be ⅛ to 5/16 in. less than the height of the table saw to allow for a slight bending down of the material, from its own weight, as it passes over the edge of the table saw. If this allowance is not made some difficulty will be encountered in getting the material to roll across the top of the rollers.

The doorstops used on the mobile

Fig. 3. The mobile tool panel used at the circular saw

panel are necessary to keep the panel from rolling away from the table saw as the material being ripped begins to pass over the rollers. When the panel is being used to support material that is being ripped, the doorstops should be *kicked* down on the floor. Each doorstop creates a pressure point on the floor and prevents the panel from rolling away from the table saw. After the panel is used to support material that is being ripped, the doorstops can easily be brought up off the floor with the foot and *kicked* back into a friction catch which holds them securely. The type of doorstop used will depend upon the height of the platform casters used under the mobile panel.

Use of the mobile panel results in time and motion saved. The time saved is the time it takes to secure tools from storage and return to the table saw. The motion saved is the motion of traveling the distance to the source of accessory tools and return to the table saw. The time saved may appear relatively unimportant, but when figured over a semester or school year it

amounts to additional time that can be utilized in teaching students additional material.

The results of a stop watch study made on the use of the mobile panel showed that it can save time and motion as well as cut down on the traffic hazard in the shop. The students do not have to leave the table saw to secure any accessory tool; he can reach down and secure it from the mobile panel. If the desired tool is on the other end of the panel, swing the panel around until the tool is within easy reach.

Students can be taught to place the saw blades and other accessory tools of the table saw on the mobile panel as they are taken off the arbor of the saw. This minimizes the placing of sharp saw blades flat on the top surface of the table saw and damaging the teeth of the blade or the set.

The mobile panel makes a shop a safer shop for students to work in by eliminating the traffic hazard to and from the table saw. When a traffic hazard has been eliminated the safety factor in a shop has been increased. The traffic to and from the source of accessory tools is eliminated completely and any traffic to the table saw does not cut across the path used by a student that is changing tools on the arbor of the table saw.

The mobile panel is ideal for a teacher demonstration that is to be viewed by students. All tools that will be used by the demonstrator are within easy reach. This eliminates the chance of the demonstrator forgetting an important tool and having to interrupt the demonstration to secure it.

Mobile Panel for Hand Tools Also an Advantage

A time and motion study was made on using the mobile panel for hand tools. The mobile panel was compared with the wall panel and tool room.

Three centralized positions were located among the six, four-place workbenches used in the industrial-arts department, State College of Washington, Pullman, Wash.

One average for each position was derived by timing students as they left the work station, went to the wall panel and returned. The same procedure was employed on the mobile panel and the tool room.

The average time taken by students going to the tool source and returning to the work stations was averaged for each of the three positions among the workbenches. The final average represents the average time a student would take in going to the tool source and returning. This average was used in making all comparisons between the mobile panel and wall panel and between the mobile panel and the tool room.

The time saved by using the mobile panel compared to using the wall panel was 18 minutes when figured over a semester of 18 weeks, 5 days a week, using 50 minute periods. The mobile panel compared to the tool room saved 1 hour and 55 minutes over the semester.

The 18 minutes saved over the wall panel and the 1 hour and 55 minutes saved by not using the tool room amounts to enough time to include additional information in the shop program without at all taking away from the student's work time in the shop.

The time saved may seem relatively unimportant, but the added safety factor of cutting down on traffic to and from the source of tool supply is significant. Using the mobile panel the traffic to and from the source of tools is eliminated. Any traffic for special tools will be divided and distributed equally among the aisles between the workbenches. The mobile panel minimizes traffic, saves time and motion; both will result in greater safety in a shop.

Independent operators drill about 77 per cent of the wells that open new fields.

A Course of Study in Related Physics for Machinists

JAMES A. PARKER

Formerly at Phelps Vocational High School

Washington, D. C.; now at

Djakarta, Indonesia on the Tuskegee-Indonesia Project as Teacher Trainer Adviser

Blocks of Machine Shop Work

Machine shop breakdown: (1) drill press; (2) lathe; (3) shaper; (4) surface grinding; (5) cylinder grinding; (6) tool and cutting grinder; (7) milling machine; (8) maintenance; (9) heat treatment of metals; (10) benchwork; (11) forging.

Drill press (operational breakdown): (1) use of jig or fixture; (2) drilling to punch marks; (3) drilling to a given depth; (4) countersinking; (5) grinding drills: freehand or drill grinder; (6) counterboring; (7) reaming; (8) tapping; (9) spot facing.

Lathe (operational breakdown): (1) centering in lathe; (2) facing ends of stock between centers; (3) straight turning on centers to one diameter; (4) shoulder turning and recessing; (5) knurling; (6) taper turning: tailstock method; (7) taper turning: taper at-

A Type of Correlation

Grinding of a Lathe Tool

Machine Shop	*Related Science*
Speed — size of wheel	Acceleration, momentum, material velocity
Forces — balance	Centrifugal, centripetal, kinds of tools
Heat — (wet or dry wheel)	Burning out of carbon, quenching, tempering
Types of Tools to be ground, kinds of metals	Structure of different metals
Shaping of tools, friction, shearing	Rake, clearance
Composition of grinding wheel	Grain, bond porosity

tachment method; (8) thread cutting: V; (9) drilling and tapping in universal chuck; (10) tool post grinding; (11) boring and reaming to one diameter: in chuck.

Shaper (operational breakdown): (1) shaping one surface in vise; (2) shaping more than one surface in same plane; (3) shaping more than one surface not in same plane; (4) shaping to shoulders; (5) angular shaping; (6) shaping keyways.

Surface grinding (operational breakdown): (1) grinding one surface: work held on magnetic chuck; (2) grinding more than one surface: work held in vise or magnetic chuck; (3) grinding more than one surface: use of angle plate; (4) grinding to shoulder; (5) angular grinding.

Related Science — Analysis of Trade, Subject, or Activity

BLOCKS OF SCIENCE

Related physics for the machine shop: (1) matter; (2) machine and mechanics; (3) work — power and energy; (4) forces; (5) friction; (6) fluids; (7) speed ratios; (8) mechanics of materials; (9) strength of materials; (10) heat — heat treatment; (11) magnetism; (12) electricity — emphasizing simple quantitative applications; (13) motion; (14) methods of transmission of energy.

Analysis of Related Physics

BLOCKS OF SCIENCE

Matter Block

1. Definition
2. States
3. General structure
4. Rearrangement of molecules in: cast and other grades of iron; different grades of steel and other alloys; white metals; tool steel for cold chisels; steel for a lathe tool.
5. Consideration of the properties of metals and nonmetals in relationship to the machine shop.
6. Properties of matter: general; specific — how to identify samples of metal for a job.
7. Measurement: English and metric system; conversion of one into the other with emphasis placed on measuring instruments used constantly in the machine shop such as: micrometers, vernier gauges, rules, scales, graduations.

Work — Power and Energy Block

1. Definitions
2. How each is measured
3. Kinds of power and energy — those used in the machine shop
4. Importance of each in the machine shop
5. Problem-solving concerning each

Machines — Block

1. The six simple machines — many of the simple tools used
2. Complex machines — the machines of the shop and many of portable machines
3. Power transmission for the various machines in the shop
4. Consideration of gears, differential pulleys, etc.
5. Efficiency of machines
6. History and development of some of the various machines

Heat treatment of metals — block

1. Structural change in metals due to heat
2. Temperatures at which different metals lose their magnetism
3. Simple methods of distinguishing temperature of metals
4. Fuels and furnaces used for heat treatment
5. Consideration of the importance of physics in: normalizing — puts steel back to normal condition; annealing — to soften metal that may be too hard; quenching — using water, brine, oil, or air; tempering — may be used to relieve internal strains.
6. The importance of knowing the following about metals before and after treatment: physical soundness — flaws, stress and strains; timber; toughness; safety — how to handle; utility; hardenability.

Electricity Block

1. General discussion to get the over-all view
2. Types of motors — used in the machine shop
3. Magnetism — metals held on machines by magnetism
4. Consideration of single- and three-phase motors
5. Use of rheostats and condensers in operating machines
6. Kinds of currents
7. Supplementary information such as: failure of motor to start; motor runs hot; motor burns out; motor is noisy; motor runs but governor does not operate; excessive brush wear.

Friction Block

1. Kinds
2. Advantages and disadvantages
3. How friction is reduced in the machine shop: lubricants, coolants
4. Ways of increasing friction
5. Effects of friction on different kinds of metals
6. How friction is used or brought about in: grinding, polishing; filing, sawing; chipping; with cutting tools; machines such as: milling, shapers, drill presses.

1. *Major Equipment Available or Needed:* The equipment of a related physics laboratory should include not only the conventional equipment but many of the tools and simple machines used in the machine shop.

2. *A Partial List of Supplies Needed by the Class:* The supplies for this type of science class are many and varied. For that reason about $10 per pupil should be allowed for expendable materials: metals — kinds most often used in the machine shop; compound for illustrating the unequal expansion of metals; Graves ball and ring for illustrating the expansion of metals upon application and contraction upon withdrawal of heat; microscope; gauge blocks; samples of grinding, polishing, and buffing wheels; lubricants and coolants; pyrometers; different kinds of fluxes; different kinds of abrasives; spring balances; graduated cylinders; Archimedes principle apparatus; Hooke's law apparatus; trip balances and weights.

Instruction Sheets

Sheets that are used in the machine shop which could be used also in the related physics class:

1. *Operation Sheet.* This sheet deals with the learning units that involve skills, and gives definite instructions for performing the operations.

2. *Information Sheet.* This sheet gives facts or information concerning tools, materials, or other matters connected with the vocation. It deals with that phase of information that gives a background for the work of the trade.

3. *Assignment Sheet.* This type of sheet is used in making assignments for investigation, and in the presentation of problems and scientific principles.

4. *Job Sheet.* This sheet undertakes to tell how to do a complete work job. It includes every phase of instruction necessary in doing the job and is adapted to quantity production.

Sample Experiment Sheet

Block I. Matter

Estimated time: One period

Experiment title: Becoming acquainted with matter.

Objectives: To prove that matter has weight and occupies space. To develop a sense of values.

Assumed knowledge of students: The general properties of matter.

Materials:

Balances	200 cc. beaker
Weights	Air pump
Battery jars	Toy balloon
Small pieces of metal	500 cc. cylinder
Water or oils	

Procedure:

1. Using a balance scale, weigh the following pieces of metal and record in

block below. *Material* *Weight*
Lead .....
Iron .....
Wood .....
Any object .....

2. Using a scale balance, weigh first the 200 cc. beaker empty and then add 100 cc. of water or oil and reweigh. Subtract the weight of the empty beaker from the weight of the beaker and fluid and you have the weight of the fluid. Record results in block below.
.....
.....
.....
.....
.....

3. Using a scale balance, weigh a toy balloon. After the balloon has been weighed, fill it with air by means of your air pump and then reweigh. Subtract the weight of the empty balloon from the weight of the filled balloon and the difference will be the weight of the air.
Record results in the block below.
.....
.....
.....
.....
.....

4. Fill a batter jar with water (half full). Mark level of water on the jar by placing a piece of tape on the outside. Place a piece of metal in the jar and then with a second piece of tape mark the new water level. Note results. The difference in the levels before and after denotes the volume of the piece of metal. Record results.
.....
.....
.....
.....
What kind of measurement do you call this? .....
What property of matter makes this part of the experiment possible? .....
Conclusions: Explain why you believe that matter has weight and occupies space.

Questions:
1. What things in the machine shop could be called matter? Why?
2. List the different classes of matter.
   a) .....
   b) .....
   c) .....
3. Of what importance is matter to the machinist?
4. Is the electricity which runs your machine in the shop classified as matter? Why?

Sample Experiment Sheet

Instructor's name:
Estimated time: One class period
Block: Strength of materials
School:

Experiment title: Toughness of steel
Objectives:
1. To have the students become acquainted with some simple methods of testing the toughness of steel.
2. To develop skills in setting up, using, and taking down scientific apparatus.

Materials:
1. A machined piece of steel
2. A simple pendulum (heavy)
3. A vise and a clamp
4. A hammer which may be used as a pendulum
5. A small heating furnace
6. A sheet of steel

Assumed knowledge of students:
That steel has different grades of toughness.

Information:
Toughness — the ability to resist breaking — is such a vital requirement in a hardened tool steel that the inability saves money, time, and ofttimes accidents. Toughness is measured in "foot pounds." One foot pound is the blow struck by a pound weight falling one foot. If a five pound weight falls one foot that produces five foot pounds.

Procedure:
1. Method crude impact — Support a sheet of steel on two blocks and drop a weight on it from different heights until it breaks. Measure the distance that the weight falls and multiply the distance by the weight of the weight and that will be the toughness of the steel plate in foot pounds. Record results:
2. The pendulum principle — Put a piece of steel in a vise or clamp and let a heavy pendulum swing against it. Pull the pendulum back a little farther each time until the sample breaks. Measure the vertical distance that the pendulum falls and multiply by the weight of the pendulum to find the toughness of the piece in foot pounds. Record results:
3. The Izod test — Heat a machined piece of steel about ½ in. square notched on one side. Place in a vise and use the heavy hammer as a pendulum. Note the overswing of the pendulum when the steel breaks. Record results:

Conclusion: Explain or tell why you believe that a good machinist should know how to use simple methods for finding the toughness of tool steel. Do you think that your shop teacher would have been interested in this experiment? Why?

Questions: Please write your answer on a separate piece of paper.

1. What other qualities has machined tool steel other than toughness?

2. List some of the different specifications (analysis) of machined tool steel.

Sample Information Sheet

Instructor's name:
School:
Unit Title: Friction
Time allotted:
Subject Title: Lubricants and coolants
Objectives:
1. To develop within the student a better understanding of the need and uses for coolants.
2. To develop within the student a desire to know more about lubricants.
3. To give to the student information which may make this unit more meaningful.

Specific Information: When two solid bodies are caused to slide in contact with one another there is a more or less resistance to motion, which results in an absorption of energy that is manifested as heat. The resistance to motion is due somewhat to molecular cohesion, but chiefly it is due to interlocking of projecting portions on the uneven surfaces of the bodies. It is impossible to prepare a perfectly smooth surface; consequently when it is desired to lessen friction as in machinery bearings, a lubricant which is generally an oil is used to keep the metallic surfaces apart. To prevent an injury to the tool by the heat developed during use, a stream of liquid is directed against it. Because of its high specific heat, water serves well for this purpose but because plain water readily rusts clean iron surfaces, soaps are dissolved in it. Either sodium (hard) or potassium (soft) soap or salts such as borax or washing soda, all of which ionize to produce an alkaline reaction and thus offset the corrode tendency. Also it is advantageous and frequently necessary that a lubricant be used or introduced between tool and the work. Then for this double purpose the liquid used commonly consists of mixtures of watery solutions with oils. Fatty oil, often lard oil, is more commonly used, at least in part because it emulsifies readily with the watery solution. Aside from their corrosion inhibitive properties the soap aids in the lubrication. That the lubrications or lubricants penetrate to the immediate neighborhood of the cutting edge of the tool is shown by the increased smoothness of the finished surface and the greater force required to keep the tool against the work. The lubricant finds its way in through the gap between the work and the beveled side of the tool, probably by the aid of capillarity. The edge of the tool being lubricated best on the beveled side nearest the work, is unable to dig in and tear the metal which is therefore finished smooth and partially burnished.

Demonstration:
Showing the type of smoothness obtained without lubricants.

Showing the type of smoothness obtained with lubricants.
Showing how some of the more common coolants actually take heat away from the work.

Questions and Problems:
Answer the questions found below; bring them into class tomorrow.

1. About how many different lubricants are there?
2. List the specifications of a good lubricant and a good coolant.
3. How could you tell if you had a good lubricant?
4. Do all metals need the same kind of coolants?
5. Find out the names of the coolants that are actually used in your shop.

Visual aids, models, mock-ups, etc.

1. *Specimens and charts from the following companies:*
   a) Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh, Pa.
   b) Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y.
   c) Norton Company, Worcester, Mass.
   d) The Carborundum Co., Niagara Falls, N. Y.
   e) Linde Air Products Co., 30 East 42nd St., New York 17, N. Y.
   f) Armour and Company, 135 West 31st St., Chicago, Ill.
2. Coolants — Esso and Gulf Gas Companies
3. Machines and other shop apparatus
4. Student-made apparatus
5. Projector
6. Camera — for taking pictures of activities of the students in and out of the related science classroom.
7. Slides and motion pictures (school film library)
   a) M-105. Height Gages and Standard Indicators
   b) M-103. Fixed Gages
   c) The Micrometer
   d) M-III. The Milling Machine
   e) M-124. Cutting Threads with Taps and Dies
   f) S-131. Fundamentals of Filling
   g) Outside films:
      1) *Your Life Work.* 2708 Beaver Ave., Des Moines, 10, Iowa.
      2) *Physics of Metal Cutting.* Cincinnati Milling and Grinding Co., Cincinnati 9, Ohio.
      3) *How to Machine Aluminum.* Aluminum Co. of America, Pittsburgh, Pa.
      4) Manufactured Abrasives. Allan Sherman, Chief, Bureau of Mines, Washington, D. C.
      5) *Hard-Facing a Key to Modern Industrial Efficiency.* Lincoln Electric Co., 12818 Cort Road, Cleveland, Ohio.

DO-IT-YOURSELF

KERMIT A. SEEFELD
Chairman, Department of Industrial Arts
University of California
Santa Barbara, Calif.

The do-it-yourself movement is not new. Man since the beginning of time has performed acts which best enabled him to satisfy his needs and desires. History is forever on the move; consequently, the self-sufficient man of another day was transformed by the industrial revolution and mass production to a dependent person. Probably because of the modern day necessity for complete dependence the do-it-yourself movement started.

If we were to define do-it-yourself we would say that it is an activity, both mental and physical, which is wholly and completely performed by a person. The element of dependence is removed. Everyone is cognizant that by definition all of our forefathers were do-it-yourself experts. A change in mode of living has robbed man of his opportunity to create independently. The do-it-yourself movement has provided opportunity to experience independence and the ability to create on a hobby or avocational basis.

Do-it-yourself has gained acceptance by the American public which is proved by the cynicism and slapstick comments and cartoons in our newspapers and magazines. "He is the only man I know who needs a blueprint to make a mess." "It's a special labor saving way for pop to make hundreds of dollars worth of sawdust." "Do with them? I've already done what I wanted to do with them. I made 'em." These are typical and offer proof of social acceptance.

Reasons for the Success of the Movement

Have you ever asked the questions, Why has an age-old activity flowered under a new name? When questioning participants in the program it was learned that economic, psychological, sociological, war, leisure time, education, business and industry and creative therapy are reasons for its success. Speaking more specifically, let us elaborate on each reason responsible for the growth of the movement.

Economics: Those who are short on cash turn to do-it-yourself in an attempt to save money. The U. S. Department of Commerce estimates that 50 per cent of the cost of home alteration is in labor and contractors' profit. Consumers Research states that a person with a $6,000 yearly salary must earn $302 to pay a $200 repair bill. Wives control two thirds of the income. Therefore, it is not at all surprising that husbands are talked into painting, papering, and laying tile floor in many homes. Households operate on a fixed amount of money. The only variable is labor which both husband and wife can provide.

Psychological: Many employees do repetitious work such as filing, posting in an office, or similar operations in a plant. The job can be learned by a worker, with a good general education background, in a few hours and ultimate efficiency can be attained in a week. Everyone desires to work with their hands. Co-ordination of mind, eye, and hand is an exhilarating experience if playing on a piano, painting with oils, or laying an asphalt tile floor. The desire to create is satisfied and participants experience a sense of accomplishment. Filing a million pieces of mail will not provide the emotional lift

made possible by the sense of accomplishment achieved when reviewing a completed wallshelf — your creation.

Sociological: All people desire social approval. The do-it-yourself movement permits you to become affiliated with one of the fastest growing groups in the nation. Eleven million homes in America own one or more power tools. Social approval is also a motivating factor in that much of the world's goods could not be possessed if it weren't for the free labor in do-it-yourself. This industrious group built 200,000 houses last year, many of which would not now exist if contractor's profits and the cost of labor were added. It has become socially respectable to handle a shovel as well as a golf club. Families as a social group build and repair. All work toward the accomplishment of an end; a barbecue pit or a swimming pool. Do-it-yourself provides balance. Demands for great specialization at work are balanced by the versatile approach at home. It seems that everyone periodically enjoys stepping back in history from our blue suit to blue jeans.

War: All of the young men who participated in World War II learned two things. One, fearlessness in beginning a project and two, the fact that anyone can handle tools. Most men in the army did. An attitude of knowing no failure and the knowledge that techniques of handling tools and material could be learned prompted many young men to begin building their own homes. While G.I. Joe was acquiring knowledge and skill which could later be used in do-it-yourself, his wife or girl friend secured employment in factories. Migrations from service occupations to factories provided a double barreled impetus for do-it-yourself. Women in industry learned how to use tools and also learned that the privilege was not reserved for men. Second, service people such as hairdressers accepted employment in industry. The American woman faced difficulties in hiring professional services. As a result Toni, a do-it-yourself hair curling kit came on the market. The G.I. Bill also affected the do-it-yourself growth. Home finance insured by the government made it possible for young people to build homes. Veteran home finance has led the way for small down payments on homes for everyone, consequently home ownership has jumped from 44 per cent in 1940 to 51 per cent in 1950. Population increased 11 per cent during those 10 years while home ownership increased 40 per cent. Everyone knows that new houses require many new or additional furnishings. If new home owners indebted themselves to the ultimate to buy a home they would be the first to want to save a dollar by doing it themselves.

Leisure Time: Fortune magazine estimates that each of us spends 2200 hours a year in leisure time and that 30 million dollars are spent annually by people doing that which they would most like to do. It is amazing how much is spent on leisure time. Twenty-three per cent of all money spent on women's clothes is for what is classified as sport clothes. Men's sports shirts are outselling the regular by 2 to 1. Statistics prove that the American sports public is participating more and watching less. Most money and time is spent on leisure by the hourly paid worker. He also owns most of the gadgets bought to take the sting of work out of work. Americans by reputation hate to be idle. They like to buy gadgets to do the heavy work, and they enjoy operating machines.

Education: Any aspect of do-it-yourself is socially acceptable. It strengthens the puritan virtue of ambition. It also builds character because something is being learned. People learn, a socially accepted ability and they learn what they enjoy whether it be hot rods, boats, tools, or barbecue pits.

Business and Industry: Without the help of business and industry's packaging and advertising do-it-yourself would not be a 6 million dollar business this year. *Better Homes and Gardens* has concentrated on helping do-it-yourself. Their circulation has jumped from 21st to 5th place. Reynolds Aluminum realizes the leisure time fixer represents a large business. Consequently they advertise and merchandise specifically for the do-it-yourself person. Chris-Craft Boat Company sells kits which represent a good share of their entire business. Thirty-five hundred books in 900 areas are published for this market. Permanent waves, ready mix pastry, and even the serve yourself stores are part of the whole picture.

Creative Therapy: A change in activity from work to play is always appreciated. The balance made possible has real therapeutic value. People forget worries and anxieties when they become involved in a do-it-yourself project. Co-operation of all members of the family also help in attaining a feeling of security.

Different Activities: Do-it-yourself is expanding to many areas. It is now possible to buy kits for garages, airplanes, and binoculars. Sponsorship is provided by police to hot rod enthusiasts. Lumber companies supervise the building of a home from the idea to the completed house. All one need possess to begin is the desire, time, and a lot. Half of the floor tile manufactured last year was laid by home owners, enough to cover half of the state of Oregon. Better than three quarters of the paint manufactured in this country is applied by the do-it-yourselfers. Seven million dollars worth of paint rollers were manufactured last year.

Future: In spite of the *Get Others to Do It for You* school, do-it-yourself will continue to grow. The show at the Pan Pacific Auditorium last year in one week attracted 100,000 people who bought 1 million dollars worth of merchandise. Thirty-five million women make their own clothes. In fact women initiate most do-it-yourself projects and do most of the inside work. In 1930 there were no shops selling hobby supplies. Today there are over 8000. Every hour of every shopping day do-it-yourselfers buy 1 million dollars worth of supplies. The shoulder trade has created a new industry. It has changed advertising from a presentation of quality to directions for using.

Industrial Arts in the Picture: What does all this mean to industrial arts. Craft Horizons states: "In this renaissance of the hand skills the craft classes at all levels play an important part. The need for inspired teachers is greatly increased." Teachers not only for adult education classes but teachers for both boys and girls who will some time in the future create things in their leisure time. One of the definitions offered for liberal education is *education for leisure.* If the definition is true all of us accept a new and ever expanding responsibility. We hope there will not be any more war which will teach both men and women how to use tools and materials. If not, the industrial-arts teachers of the country must introduce young people to the possibilities of do-it-yourself.

Conclusion: Paraphrasing Churchill, "Never before have so many done so much for themselves"; and this is only the beginning. Industrial arts is in the middle of the whole program. It is the responsibility of the schools and the industrial-arts teachers to make America a better place to live and to fill our houses with more things and better people.

The romantic glamour of moonlight, its mystery and charm, is nothing but a trick your eyes play on you. Moonlight is actually reflected yellow sunlight but is at a very low intensity, about one-millionth as bright as the summer sun. Since the human eye is more sensitive to blue light at low light intensity, the moon appears to have a bluish hue even though it is really golden. — *Westinghouse News.*

Three out of four traffic accidents happen in clear weather on dry roads. — *The Travelers Insurance Companies, Hartford, Conn.*

A Program in Lithographic Printing

BENJAMIN J. NOVAK

Formerly at Murrell Dobbins Vocational-Technical School

Philadelphia, Pa.

Now, Vice-Principal, Frankford High School

Philadelphia, Pa.

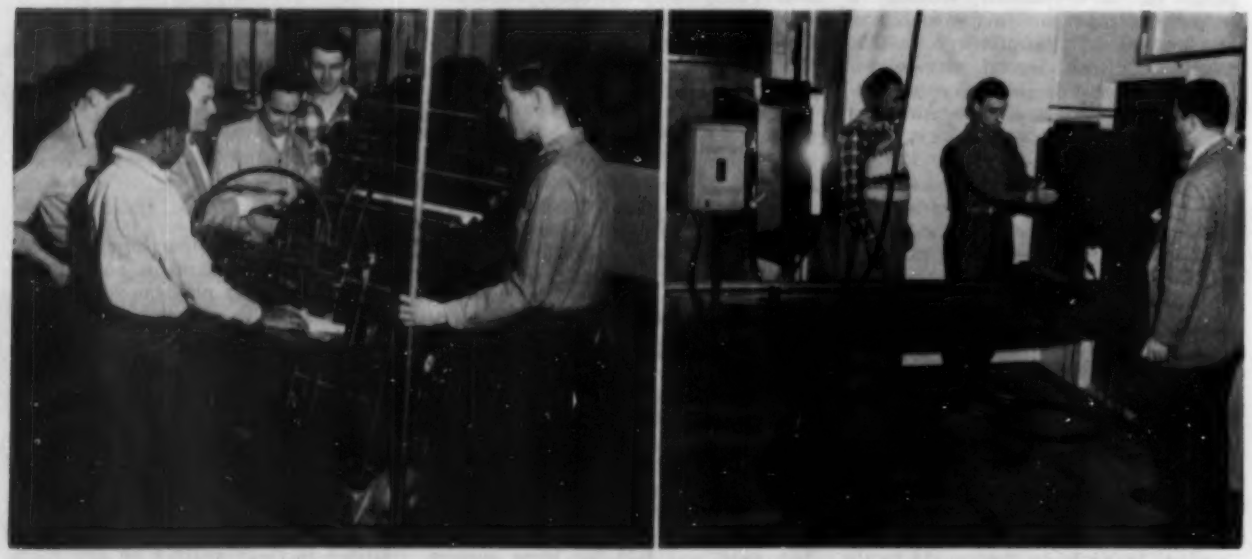
A modern lithographic printing department was opened in February, 1953, at the Dobbins Vocational-Technical School. The occasion brought to fruition the sustained effort over a period of years of many interested persons. The school now is equipped to produce craftsmen in any of the major areas of printing. The printing department is but one of 27 vocational departments now functioning in the school, enrolling over 2500 day school students, exclusive of apprentices and trade extension learners. The 8 story plant and its equipment represent a monetary value of over 12 million dollars.

The school set out 15 years ago, provided with thousands of dollars worth of the most modern letterpress printing equipment. No pains were spared to make the department as useful and up-to-date as possible for serving Philadelphia's great printing market. Local developments soon were such that the need to include lithographic (offset) printing became increasingly apparent. There is here well illustrated the maxim that, just as industry is dynamic and growing, so must vocational education be, if it is to be vital and effective.

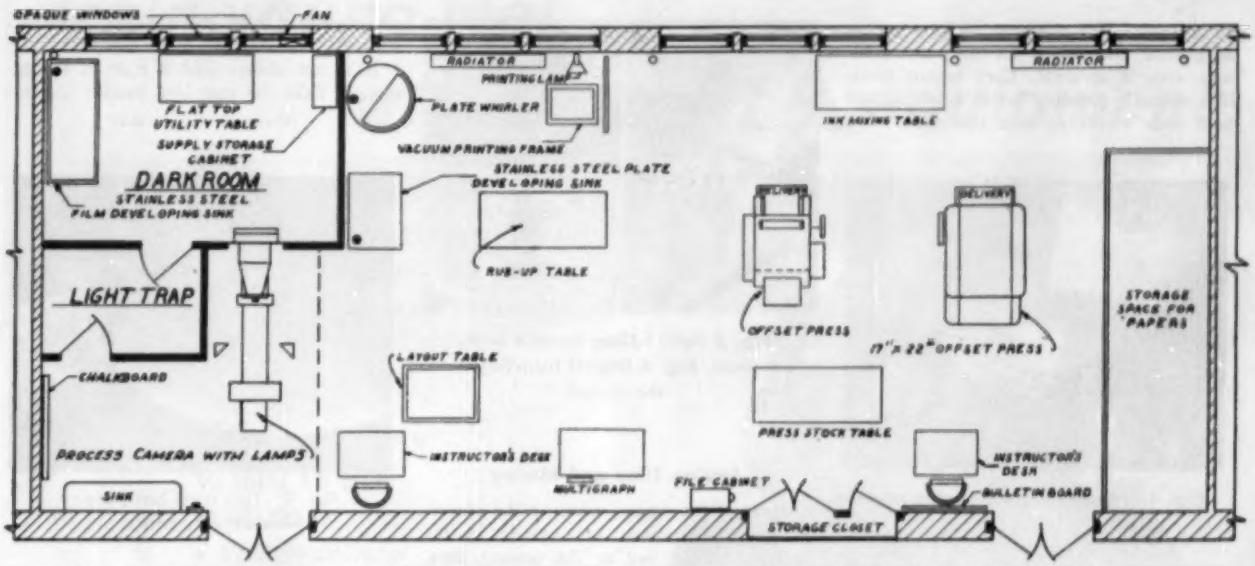
The Philadelphia Typothetae, now called the Printing Industries of Philadelphia, were mainly instrumental in establishing the original letterpress printing program of the school. This group has maintained continuous advisory contact. The letterpress printing department in 1953 had five full-time instructors — William Brogan, Samuel Garsten, Roy Granzow, James Jones, and James Henderson. Major equipment was as follows: 15 frames of type, 4 metal imposing stones (50 by 75 in.), 3 saws, vertical mitering machine, 3 proof presses, 10 linotype machines, 3 casters and 5 keyboards for monotype, 12 platen presses, 5 flat bed cylinder presses, 2 Miehle vertical presses, paper cutter, stitcher, folder.

The printing industries of Philadelphia several years ago began work in earnest on planning a training program for lithographic printing. Responsibility was assigned to the trade school and industrial committee of this organization. The Lithographic Association of Philadelphia was also interested, and a joint committee of the two groups was formed for further action. Visits were made by the committee to the school in 1951. Statistics on establishments, employment needs, and other pertinent data on lithographic printing in the Philadelphia area were compiled, and set forth in a brochure.

The need and interest having been established, the board of education and school officials began plans for the shop, equipment, and staff. Considerable advisory aid was provided by industry, which also recommended two experienced tradesmen as instructors. J. Morris Bunder teaches camera, plate, and stripping, and Richard J. Meade is responsible for presswork. The school's co-ordinator of printing, William Youlton, helped in developing teaching units, and worked with the countless organizational details of the instructional program. Professional education for the



Offset press, and at right, offset lithography camera at Murrell Dobbins Vocational-Technical School. Morris Bunder, instructor



Layout of the lithographic print shop at Dobbins Vocational-Technical School, Philadelphia, Pa.

new instructors was provided by the department of vocational teacher education at the University of Pennsylvania under the direction of Dr. Walter B. Jones.

The board of education authorized the expenditure of $30,000 for equipment, and $8,000 additional was expended for room alterations and installations. The accompanying shop layout illustrates many of the details.

Inasmuch as photographic procedures replace typesetting in lithographic printing, the camera plays a major part in the process. Instruction in lithographic printing may be placed under four heads:

(1) *Photography:* Operation of camera, lenses, exposures, films. Half-tone screen process.

(2) *Platemaking:* handling, preparing, processing.

(3) *Stripping:* make layouts, assemble pieces of a job into units for the platemaker.

(4) *Presswork.*

With the addition of lithographic printing, five areas of specialization become possible in the complete program. As can be seen from the table, the curricula are three years in length, from grades 10 to 12 inclusive, and are divided into half-year units. All printing students have experiences in hand composition during the first half year. In the second half of the year, all students have a 7-week tryout period in each of letter press work, hand composition, and offset printing. At the start of the second year there may be a choice of specialization in one of three areas. During the remaining year and half, the student elects to follow one of these specialties in letterpress printing, or one of two in offset printing. In accordance with requirements for federally aided vocational programs, half of each instructional day is spent in the classroom and other nonshop education.

At this writing, the school's printing department represents an outlay in equipment of a quarter-million dollars. The program seems well attuned to current local needs. It is realized that these needs are not likely to be constant, and it is hoped that the school can continue not only to match strides with the ebb and flow of life, but also function to give it direction, purpose, and values.

HOME AND SHOP REPAIRS WITH LIQUID PLASTICS AND FIBERGLAS

ALEXANDER F. BICK
Teacher in Milwaukee Schools
The Milwaukee Downer College
The Stout State College
Summer Session

Previous articles of this series have emphasized the use of liquid polyester resins in combination with Fiberglas for constructing tables, chairs, tanks, boats, suitcases, and similar products.

In the February issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, the covering of an old boat hull with Fiberglas was described. The present article is a continuation of the same idea applied to a series of repair jobs that will be of special interest to teachers and students.

Plastics Save Time

New resins and resin-filler combinations enable even unskilled workers to make repairs successfully, that, in many instances, would be impossible to accomplish with conventional materials and techniques. Furthermore, these new plastics have unusually good weathering properties, are resistant to rust and corrosion, temperature extremes and are unaffected by gasoline, oil fumes, and most acids. Add to this the all-important time factor, especially where emergency repairs are involved, and it becomes apparent that industrial maintenance has benefited by modern chemistry in no small way.

Students Can Make Professional Repairs

Take the case of a dented automobile fender. This is not a job for an amateur yet some of our school boys have used a combination of liquid resin and ground glass fiber and repaired fenders that could not be distinguished from new ones. These same boys have *customized* old model cars and streamlined them by means of *plastic surgery.*

Simple Technique

All repair jobs are really nothing more than simple laminating, casting, and coating operations. A hardening agent is mixed with the liquid Castoglas resin, usually at the rate of 2 per cent. This is the equivalent of about 15 drops of Hardener per tablespoon of liquid resin, or 2 teaspoons of Hardener to 1 pound of resin. At room temperature, this mixture hardens in about

30 minutes. The addition of fillers, such as ground glass fiber, Castosil, metal filings, etc., is optional. They impart steel-like strength, promote better adhesion and hold resin shrinkage to a minimum.

Fig. 1. Measuring Castoglas resin

Fig. 2. Adding hardener

Fig. 3. Adding fiberglas filler

Fig. 4. Mixing thoroughly

Fig. 5 (left) Filling handle with resin. Fig. 6 (right) Inserting the chisel

Saving Time and Money

Most of the repairs shown in the accompanying illustrations were made in the spring of 1953 and at the present date, every one of them is still in excellent condition. In all of them, an amazing economy factor in money and time will be apparent. For example, the chisel was repaired for less than 2 cents; the corroded pipe, 26 cents; the birdbath, 2 cents; and the patch on the gutter, 5 cents.

When you realize the cost of a new section of gutter, the labor, etc., the resin patch is really an unheard of economy. The same can be said for the corroded pipe which was an emergency acid line repair whose failure might have stopped plant operation for hours, running into hundreds of dollars. As it was, not a minute was lost.

Another example, not illustrated, is the repair of a cattle tank that had cost $35 when new. The tank in question had been taken to a farm dump as a hopeless loss. When these materials appeared on the scene, the tank was cleaned and repaired in 20 minutes and at a material cost of only 35 cents. It is still in use — three and a half years later.

The boat patch cost only 45 cents for materials and actual working time was one hour. Complete repair cycle was 90 minutes. Within this time, the resin patch had set rock-hard and the finishing coat of Castoglas Enamel had dried tack free.

It is not always just a case of saving money. Take the cast iron handle, for in-

(Continued on page 26A)

Fig. 7 (left) Repairing corroded pipe connection. Fig. 8 (right) Fixing broken plastic handle

Fig. 9. This bird bath won't leak any more

Fig. 10. Permanently patched for five cents

Fig. 11. Stronger than a new crank

Fig. 12. Materials: 8 cents; time: 4 minutes

train young men with Curtis equipment

CHANCES ARE THEY WILL WORK WITH IT LATER

precision made with 102 years of experience

NEW CURTIS "CV"

¼ thru 15 H.P.

FEATURES:

- Positive unloader (not affected by Power Failure)
- Timken main bearings
- Centro-Ring Pressure Oiling
- ASME Tank with ASME Safety Valve

ALL-PURPOSE SINGLE POST FRAME LIFT (FULL HYDRAULIC)

Provides maximum accessibility to speed up shop work *and* costs less to buy—less to install than any type of two-post Lift. 60″ wheelbase range.

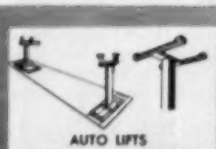
For complete technical data on any CURTIS products— mail a post card to CURTIS, listing products in which you are interested.

Remember YOU CAN COUNT ON OUR 102nd YEAR

Curtis

MANUFACTURING COMPANY • PNEUMATIC DIVISION

1909 KIENLEN AVENUE • ST. LOUIS 20, MO. CM-8


AUTO LIFTS SINGLE AND TWO POST

HIGH PRESSURE CAR WASHER

INDUSTRIAL AIR COMPRESSORS

AIR HOISTS AIR CYLINDERS

PACKAGED AND REMOTE AIR CONDITIONING EQUIPMENT

HOME AND SHOP REPAIRS WITH LIQUID PLASTICS

(Continued from page 11B)

stance. It belonged to an old gasoline pump that was used every day. Not one of the six hardware and farm supplies stores in town had anything on hand that would fit. It took a man more than an hour of running around to find that out. Castoglas and Fiberglas tape made it stronger than a new handle. Cost: 12 cents.

Fig. 13. Good as new when finished

Fig. 14. Preparing plywood boat bottom

Fig. 15. Pouring resin filler mixture

Fig. 16. Sanding rock-hard patch 30 minutes later

The gooseneck of the washbowl finally gave in to the corroding effect of the chemicals used periodically to clear the line. You can't just buy one piece to repair it, you've got to buy the whole section and sometimes wait for delivery.

Illustrations Show Process

Let's now turn to the illustrations which speak for themselves. In Figures 1, 2, 3, and 4, the resin is mixed with hardener and filler — the basic procedure for all repairs. Then follows a series of practical home and industrial repair operations, some of which have already been mentioned in the foregoing.

Fig. 17. Ninety minutes from start to finish

Automotive Equipment, Tools, and Supplies

This list of automotive equipment tools and supplies was prepared by the Automotive Industry — Vocational Education Conference on public school automotive instruction. It is reproduced here by permission for which A. D. Althouse, Detroit Board of Education and co-chairman of the conference deserves special credit.

Because yearly changes in car and truck design often necessitate new service procedures, and consequently new types of tools, shop equipment must be replaced when it becomes obsolete as well as when it wears out.

The Automotive Industry — Vocational Education Conference therefore suggests the following amortization policy: hand tools, 2 years; special tools and testing devices, 3 years; and automotive parts, 3 years.

Supplies and Equipment

AIR HOSE
25' length, ¼" I.D., 5 ply red, complete with ¼" pipe fittings

BATTERY BOLTS
5/16" x 1½" U.S.S. lead coated battery terminal bolts complete with nuts

BATTERY CLIPS
1. "B" battery clips cadmium plated
2. 50 ampere battery charging and test clips, lead coated

BATTERY COMPOUND — battery sealing compound

BINDING POSTS — screw type

BLADES
1. Hand hack saw, 24 teeth per inch
2. 10", 32 teeth per inch hand hack saw

BRUSHES
1. 1½" flat
2. 14" x 1½" steel wire, curved handle
3. 6" diam. steel, wheel
4. 8" bench or counter

BULBS
1. Auto lamp bulbs, 6 and 12 volt
2. Lamp auto, sealed beam No. 50-40 watts, double filament, three contact, 6 and 12 volt
3. Battery charger bulb (specify ampere capacity)

CABLE
1. Extension cable, double conductor, molded rubber covered, 18 ga. heavy duty
2. Primary, single conductor, stranded copper braid and lacquer covered, 14 gauge
3. Secondary, 7 millimeter, rubber, braid lacquered brown
4. Starter cable, No. 1 gauge rubber and woven cover insulation.
5. Starter cable, No. 6 gauge rubber and woven cover insulation

CABLE TERMINALS
1. Battery cable ground lugs for No. 1 starter cable
2. Battery cable ground lugs for No. 6 starter cable
3. Battery cable terminals, universal type or equal
4. Clip type, high tension terminal for 7mm. cable
5. Terminals, as-sos-11 solderless
6. Terminals, 5/16" hole primary
7. Terminals, 5/16" spade type primary

CHECKS, TOOL — brass, 1" round

CLEANING COMPOUND
Oakite, Stoddart solvent or other material depending on the type of cleaning tank used.

CLIPS — crocodile

COTTER PINS
1. 1/16" x ¾", box of 1000
2. 3/32" x 1", box of 1000
3. ⅛" x 1½", box of 1000

DRILLS
1. H.S.S., ¼", jobbers, straight shank
2. H.S.S., 5/16", jobbers, straight shank
3. H.S.S., 15/64", jobbers, straight shank
4. H.S.S., 7/32", jobbers, straight shank
5. H.S.S., ½", jobbers, straight shank
6. H.S.S., 17/64", jobbers, straight shank
7. H.S.S., 9/16", jobbers, straight shank
8. H.S.S., 21/64", jobbers, straight shank
9. H.S.S. 23/64", jobbers, straight shank
10. H.S.S., ⅜", jobbers, straight shank
11. H.S.S., 25/64", jobbers, straight shank
12. H.S.S., 27/64", jobbers, straight shank
13. H.S.S., 7/16", jobbers, straight shank
14. H.S.S., 29/64", jobbers, straight shank
15. H.S.S., ½", jobbers, straight shank

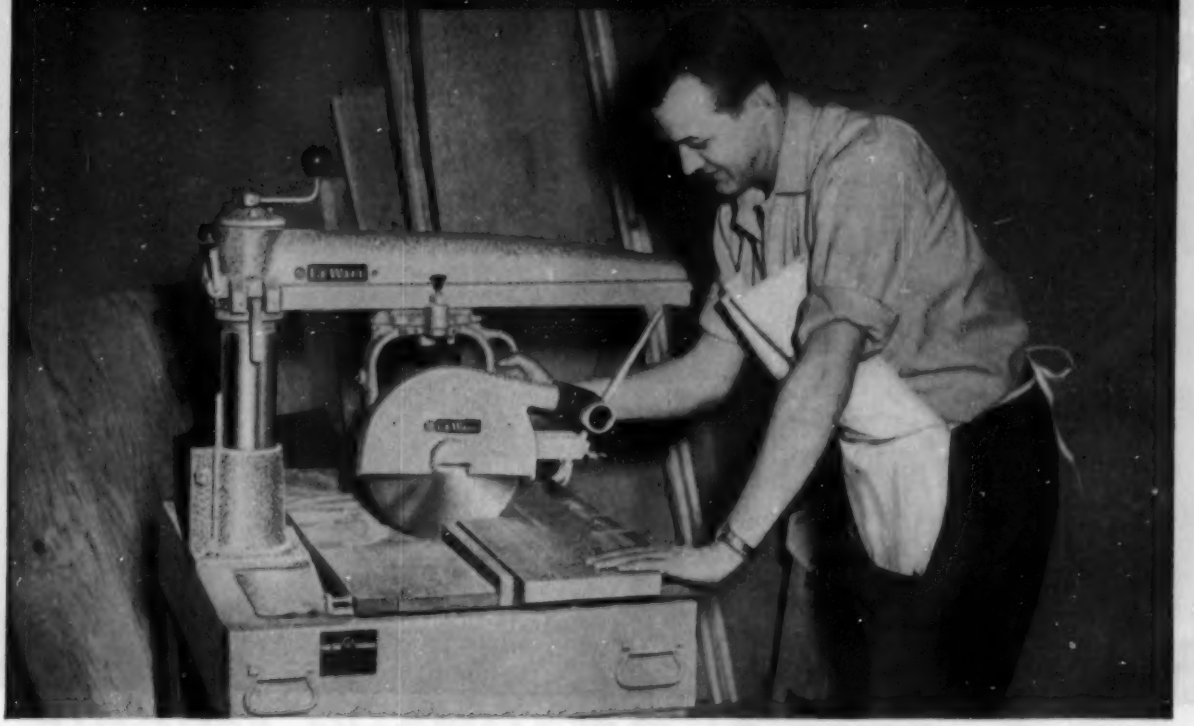
DRY CELL
No. 6 dry cells, with screw connections

EMERY CLOTH — No. 2/0, 9" x 11"

FILE
1. 10" flat bastard (24 minimum)
2. 10" half round bastard (6 minimum)
3. 10" half round lead float (4 minimum)
4. 10" hand smooth (12 minimum)
5. File handle, large, medium, small (specify size), (24 minimum)
6. 10" mill smooth (12 minimum)
7. 10" round bastard (6 minimum)
8. Ignition point file (10 minimum)
9. Regulator point file, Delco-Remy model W-19
10. 6" saw file, extra slim taper (4 minimum)
11. Warding, 6" smooth (4 minimum)

(Continued on page 36A)

Your students will use AMF De Walt machines after graduation...



Are you training them on AMF De Walt now?

Consult management men yourself – they'll tell you AMF De Walt® outsells all other machines because it brings modern industry greater job safety, greater all-around flexibility plus many, many more exclusive benefits.

You owe your students the right to be trained on modern equipment – plan now to install AMF De Walt in your shop. Available in many sizes – priced to meet school budgets. See your AMF De Walt Dealer today.

EXTRA! FREE! Send for these today!

- New idea book for industry – helps you teach dozens of ways to cut costs on cutting jobs.
- 22-minute 16mm. sound film on AMF De Walt – ideal for classroom showings.

Here are 4 of the many AMF De Walt Safety exclusives!

SAFETY LOCK KEY SWITCH – Key starts and stops motor. No accidental starts – you have the key!

AUTO-FLOAT SAW GUARD – Covers saw blade or dado head in every operating position.

MAGNETIC SAFETY BRAKE – Automatically stops saw blade in a few seconds.

SHAPER SAFETY GUARD – Provides complete safety, covers shaper cutter and arbor.

Another AMF Product

DE WALT POWER TOOLS

Lancaster, Penna.

AMF DE WALT
Dept. IA-56-3, Lancaster, Pa.

Please send:

☐ New idea book for industry
☐ 22-minute 16mm. sound film

NAME_____

ADDRESS_____

CITY_____ STATE_____

DELTA
ROCKWELL

For
Metalworking

DRILL PRESSES
17", 14", 14" Super Hi-Sensitive

TOOL GRINDERS: 7" Standard Grinder, 6" Carbide Grinder

CUT-OFF MACHINES: Wet Abrasive, Dry Abrasive, Non-Ferrous Metal, Wood

GRINDERS: Toolmaker Grinder, Standard Surface Grinder, Chip-Breaker Grinder, Tool & Cutter Grinder

11" METAL CUTTING LATHES
Five-foot bed, Four-foot Bed

BELT GRINDERS: 2½"

BAND SAWS: 14",
8-Speed Metal-Wood

DELTA . . . PRIDE OF THE NATION'S SCHOOLS

DELTA
ROCKWELL

For
Woodworking

SHAPER
Industrial and Bench

CIRCULAR SAWS
12", 10" Tilting Arbor, 10" T.A. Bench

BAND SAWS
20", 14"

RADIAL SAWS
20", 14", 10", 9"

JOINTERS
8", 6" Long Bed

SCROLL SAW: 24"

PLANER: 13" x 5"

ROCKWELL-BUILT

DELTA power tools

World's most complete, most versatile, most useful line of metalworking and woodworking power tools

53 Machines...246 Models...Over 1300 Accessories

SAFE
SIMPLE
ACCURATE
PRACTICAL

Safety is built right into Delta tools—assures maximum protection for student, prevents damage to tool. One important reason why over 70% of U.S. school shops are Delta equipped.

Simplicity of design makes Delta tools remarkably easy to operate. Students learn quickly, need minimum instruction. Helps you take care of increased enrollments because you teach more students in less time.

Delta quality tools are accurate—and built to *stay* accurate! Delta's years of unmatched experience, plus the finest manufacturing facilities and highest quality materials, assure years of dependable operation, low maintenance.

Teach with the tools so widely used throughout industry. More and more of your students will use Delta tools on their jobs after graduation—another important reason for training them on Delta tools *now*.

Delta's leadership is based not only on fine quality tools, but on the highest type cooperation and service. Helpful Delta "How To" books, films and publications provide information and ideas for practical, effective industrial arts instruction. And your nearby Delta Dealer provides prompt, efficient service when you need it. He's listed under "TOOLS" in the yellow pages of your phone book.

Send for all The Facts NOW!

DELTA ROCKWELL

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

Delta Power Tool Division, Rockwell Manufacturing Co.
402C N. Lexington Avenue, Pittsburgh 8, Pa.

- ☐ Send fact book on using Delta Power Tools teamed with Machine Tools.
- ☐ Send complete Delta Industrial Catalog.
- ☐ Send name of my nearest Delta Dealer.

Name_____ Title_____

School_____

Address_____

City_____ County_____ State_____

Woodworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent, or sound movies, may be used by the students in the industrial arts and vocational education courses.

BENCH
1. Shop, with hardwood tops, 1¼ in. or over in thickness, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.
   It may be well to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type
2. Glue
3. Stain, with metal-covered top
4. Teacher's demonstration

BOOKCASE

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, finishing materials, hardware, small tools, supplies, etc.

CHAIRS — teacher's and tablet arm

CHALKBOARD — permanent or portable

CORE OVEN — for patternmaking class

DESK — teacher's, with drawer compartments

FURNACE — for melting soft metals (for patternmaking class)

GLUEPOT — 1 qt. or 2 qt., electric, gas, or steam heat

GLUE WARMER OR COOKER — 1- to 5-gal. capacity

GRINDER
1. Automatic knife, direct-motortype. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
2. Bench, hand or power
3. Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
4. Revolving oilstone, pedestal type, with one fine and one coarse oilstone

JOINTER
1. 6- or 8-in. portable jointer. Table to be fitted for rabbeting. Safety-cylinder type, equipped with safety guard.
2. 12, 16, or 18 in. direct motor drive, ball bearing. Cylinder to be of safety-head type. Table to be fitted for rabbeting. Jointer to be equipped with safety guard.

LATHES
1. 6- to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24, 36, 48, 60, or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block.
2. Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable speed motor, faceplates and floor stand. (For patternmaking class)

MORTISER
1. Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod.
2. Portable, vertical, hollow-chisel mortiser, bench type

PLANER — 12, 18, 20, 24, or 30-in., motor or belt driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-trade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible.

SANDER
1. Belt, direct motor drive
2. Disk, motor or belt driven
3. Oscillating spindle, motor driven
4. Portable, hand-plane type, direct motor drive
5. Vertical spindle and disks sander

SAWS
1. Band saw, 20 to 36 in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
2. Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded.
3. Cutoff, pedestal or swing type to be fitted with 12, to 16-in. saw
4. Filing machine, direct motor drive
5. Jig, direct motor or belt driven
6. Portable band saw, 14 to 20 in. ball bearing, motor driven
7. Saw bench, directly connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
8. Universal saw bench, 14 to 16 in., motor driven
9. Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cutoff gauges

SHAPER
1. Motor drive, single or double spindle. Table to be equipped with removable center plate.
2. Portable shaper or router with a suitable selection of cutters

TENNONER — single end, with coping heads and cutoff saw

VISES — rapid-acting or solid-nut type woodworking-bench vises, 7 to 10 in.

WOOD TRIMMERS — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class).

Woodworking — Small Tools

AWLS — brad, assorted sizes

BEVELS
1. Protractor
2. Sliding T, 8 in.

BITS
1. Auger, 5/16 to 1 in., inclusive, by 16ths
2. Auger, 5/16 in. to ½ in. inclusive, by 16ths
3. Braces, ratchet type, 8-, 10-, 12-, or 14-in. sweep
4. Countersink, for wood, rose pattern, ½ in. and ⅝ in.
5. Dowel, square shank, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.
6. Expansive, ⅞ in. to 1½ in.
7. Expansive, ⅛ in. to 3 in.
8. Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
9. Screw driver square shank, ¼ in., 5/16 in., ⅜ in.
10. Twist drill for wood, square shank, 1/16 in. to ⅜ in. inclusive, by 16ths
11. Twist drill, straight shank, 1/16 to ⅜ in., inclusive, by 32nds

BLOWTORCH

BROOMS

BRUSHES
1. Bench duster, 10 in.
2. Floor

3. Glue, round, ½ and ¾ in.
4. Glue, round, 1½ in.
5. Marking, camel's hair, No. 1 and No. 2
6. Varnish, flowing, 2 and 2½ in.
7. Varnish, flat, ½, ¾, and 1 in.

BURNISHERS — oval or round

CAN OPENER

CARVING TOOLS
1. Sets containing 6 tools
2. Sets containing 12 tools

CHISELS
1. Cold, machinists', ⅜ and ½ in.
2. Mortising chisel and bits, ¼ to ⅜ in. by 16ths
3. Socket firmer, bevel edge, ⅛, ¼, ½, ¾, 1, and 1½ in.
4. Socket firmer, plain edge, ½, ¾, and 1 in.
5. Tanged firmer, bevel edge, ⅛, ¼, ½, ¾, 1, and 1¼ in.

CLAMPS
1. Bar, 24, 36, 48, and 60 in.
2. Hand-screw, 4, 5, 6, 7, 8, 10, 12, and 14 in.

DIVIDERS — wing, 6 in. and 10 in.

DOWEL PLATE — 6 in. long

DOWELING JIGS — with bushings

DRAWKNIVES — 7 in.

DRILL
1. Automatic hand, with 8 drill points
2. Chuck, 0 to ⅜ in.
3. Hand, 0 to ⅜ in., for round-shank drills
4. Star, for concrete, ½ and ¾ in.

FILES
1. Auger bit, assorted, 6 in.
2. Cabinet, 8 and 10 in.
3. Card and brush
4. Flat, wood, 10 in.
5. Mill, bastard cut, 12 in.
6. Round, bastard cut, 12 in.
7. Taper, slim, 5½ and 7 in.

FIRST-AID CABINET AND SUPPLIES

GAUGES
1. Bit, adjustable
2. Jointer
3. Marking, metal or hardwood
4. Mortise, metal or hardwood
5. Panel

GLASS CUTTER

GOUGES
1. Tanged firmer, outside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
2. Tanged firmer, inside ground, handled, ⅛, ¼, ½, ¾, and 1 in.
3. Spoon, ½, ¾, and 1 in.

HAMMERS — claw, bell faced, 10, 12, 13, and 16-oz.

HATCHET — bench, 4-in. cut

JARS — earthenware, 1 qt. capacity

KNIVES
1. Jointer, to fit power machine
2. Planer, to fit power machine
3. Sloyd, 3-in. blade

LEVELS
1. Wood, 24 in.
2. Machinists', 12 in.

MALLETS — hickory, 3 by 5 in. head

NAIL SETS — 1/16 and 3/32 in. points

OILERS — bench, ⅛ pt., coppered, best grade

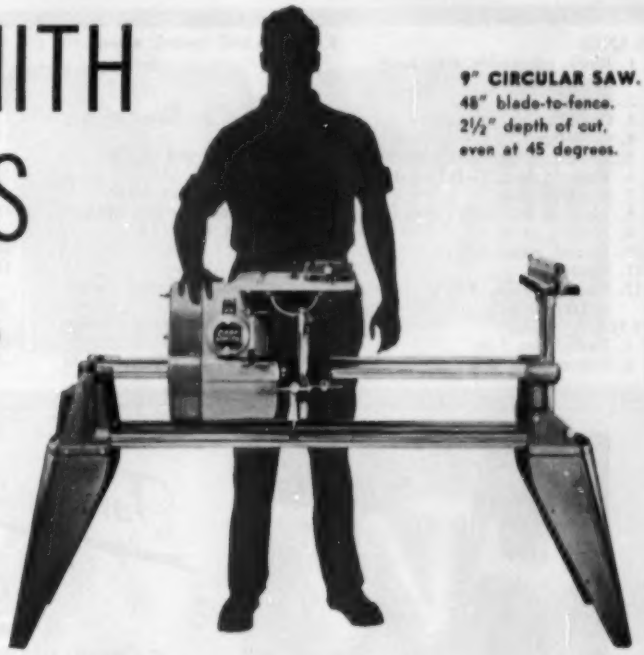
OILSTONES
1. 1 by 2 by 8 in. in iron box
2. Gouge slip, medium, 4½ by 2⅛ by ⅜ by 5/16 in.
3. Gouge slip, fine, 3 by 2 by ⅜ by ⅛ in.

PINCERS — 6 in. carpenters'

PINCH DOGS — ¾, 1, and 1¼ in.

(Continued on page 32A)

How 1 SHOPSMITH can add 7 TOOLS to your school shop

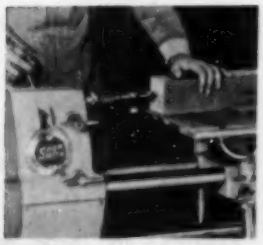


9" CIRCULAR SAW. 48" blade-to-fence. 2½" depth of cut, even at 45 degrees.

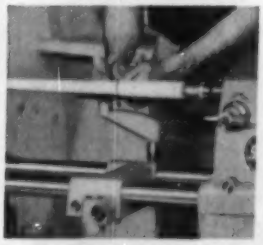
SHOPSMITH can break 7 bottlenecks in 7 minutes—use it as the tool that's needed most

12" Disc Sander. Depth control dial for feeding disc into work. Built-in jigs. Quick-change discs.

16½" Vertical Drill Press. 58" chuck-to-floor. 24" chuck-to-table. All ball-bearing spindle.

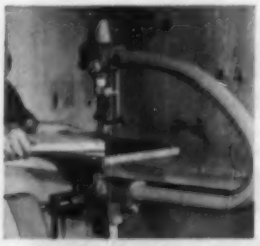


Horizontal Drill bores accurately in edges or ends of big material. Table adjusts to hairline settings.



Lathe with 16½" swing. 34" between centers. Variable speed control with exclusive Speed-Dial.

4" Jointer with 28" table, ⅛" depth of cut, can be added to Power-Mount in just 15 seconds.



18" Jigsaw with variable speeds added to Power-Mount. Can work in combination with drum sander.

Does traffic pile up at your circular saw? SHOPSMITH® can be a saw. A bottleneck at the sander? Change your SHOPSMITH to a disc sander. Need an extra drill in a hurry? You can change your SHOPSMITH to a horizontal or vertical drill in less than a minute. Log jam at the lathe? Use your SHOPSMITH as a lathe.

In fact, with its exclusive Power-Mount, SHOPSMITH can add 7 tools to your shop. All superior tools—as good or better in each application than your present single-purpose machines.

SHOPSMITH operates easily and safely, too. You can dial exact speeds required for any job with the Speed-Dial. The ¾-hp. motor and all pulleys are fully enclosed. There's a guarded switch, a special saw guard available.

This space-saving, fast-converting, flexible work station can start breaking bottlenecks in your shop the first day it's installed. Why put up with delays another season? SHOPSMITH can be delivered for only $289.50.

MAGNA Power Tool Corporation
Dept. 326-U, Menlo Park, Calif., or
Box 2808, Fort Wayne, Indiana

SHOPSMITH

Please send me your 20-page catalog on the new SHOPSMITH and information on its school applications.

Name_____

Position_____

Address_____

City_____ State_____

(Continued from page 30A)

PLANES
1. Block, adjustable, 6 in. long, 1⅝-in. cutter
2. Circular
3. Combination, adjustable
4. Core box
5. Duplex, fillister and rabbet
6. Fore, ⅛ in., 2⅜-in. cutter
7. Irons, double
8. Jack, 14 in., 2-in. cutter
9. Jointer, 24 in.
10. Round, wood, 1¾ in.
11. Router
12. Smooth, 9 in., 1¾ or 2-in. cutter

PLIERS
1. Roundnose, 5 in.
2. Side-cutting, 6 in.

PUTTY KNIVES
RASPS — half round, wood, 10 in.
RULES
1. Board
2. 1 or 2 ft. graduated by 8ths and 16ths
3. Shrink, ⅛ and 5/16 in.

SAWS
1. Back, 12 in., 14 point
2. Band, to fit power machine
3. Compass, 10 in.
4. Coping, frames
5. Coping, blades
6. Crosscut, 9 tooth, 22 in. long
7. Crosscut, circular for power machine
8. Dado, ⅛ to 1 1/16 in. to fit power-saw arbor
9. Hack, frames, 10 in. or adjustable
10. Hack, blades, 10 in.
11. Keyhole, 10 in., 10 point
12. Rip, 7 point, 22 in long
13. Rip, circular for power machine
14. Set, 10 points per inch and finer
15. Set, 10 points per inch and coarser
16. Turning frame, 14 in.
17. Turning blades, 5/16 by 12 in., 10 tooth
18. Miter box, 24 by 4 in. saw, 7 in. capacity at miter

SCRAPERS
1. Cabinet
2. Glue, triangular
3. Veneer, blade, 2¾ in. long, handle 11 in. long

SCREW DRIVERS
1. Cabinetmakers', 4, 6 and 8 in.
2. Quick return, spiral ratchet

SHOOT BOARD — and plane
SNIPS — tinners', forged steel, 2½-in. cut
SPOKESHAVES — adjustable, raised handle, 10 in. long
SQUARES
1. Combination, 12 in.
2. Try, iron handle, 8 in.
3. Framing, 2 ft.

STEEL FIGURES — hand cut, ⅛ in.
TAPELINE — 50 ft., steel
TRAMMEL POINTS — adjustable metal frame, steel points
TURNING TOOLS
1. Calipers, 6 in. inside and outside
2. Calipers, 12 in. inside and outside
3. Parting tools, ⅛ in.
4. Round point, ¼, ½, and ¾ in.
5. Spear point, ¼, ½, and ¾ in.
6. Square point, ¼, ½, and ¾ in.
7. Turning chisels, ¼, ½, and ¾ in.
8. Turning gouges, ¼, ½, and ¾ in.
9. Turning skews, L.H., ¼, ½, and ¾ in.
10. Turning Skews, R.H., ¼, and ½ in.

VISE — 3-in. jaw, anvil face
WRENCHES
1. Adjustable, 8, 10, and 12 in.
2. Headless setscrew
3. Pipe, 10 and 12 in.
4. S type or open-end type to fit ⅛ in. to 1-in N.C. nuts

LW
POWER HACK SAWS

For Speed and Efficiency

● Gravity feed ● 6" x 6" capacity using 10" x 14" blades ● Swivel vise for angle cuts ● Stops automatically on completion of cut. ● Automatic relief of blade on non-cutting stroke ● 12" x 3" clutch pulley speed 120 r.p.m. ● Expanding clutch ● Coolant pump base ● All-steel welded base and table ● Rigid frame ● V-belt drive ● Length gauge.

$334.00

3-speed (90-130 r.p.m.) motor drive arrangement with V-belts and pulleys but less motor, $38.50. ½ H. P. 1725 r.p.m. motor recommended. Completely motorized with motor and starter: Single phase $428.00; Three phase $433.00.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY
7 South St. Clair Street
Toledo 4, Ohio

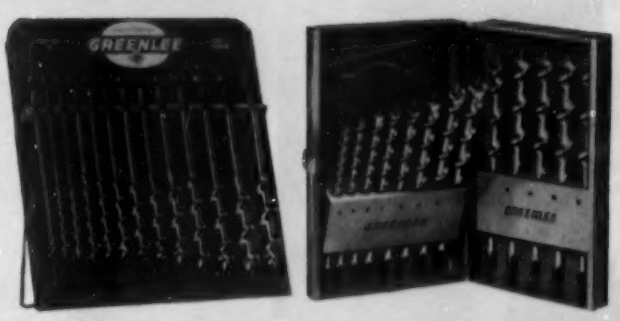
Woodworking — Materials and Supplies

ALCOHOL
BENZINE
BRADS — ⅜, ½, and ⅝ in. No. 20; ¾ and ⅞ in. No. 19; 1 in. No. 18; 1¼ and 1½ in. No. 16; 1¾ in. No. 15; 2-in. and 2½ in. No. 14
CARBON PAPER — black
COLORS — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Vandyke brown, and vermilion
COLORS — ground, in oil or japan; burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Vandyke brown, and vermilion
DECALCOMANIA TRANSFERS
DOWEL PINS AND PLATES
DOWELS — hardwood, 3-ft. lengths, ¼, 5/16, ⅜, ½, and ¾ in.

(Continued on page 34A)

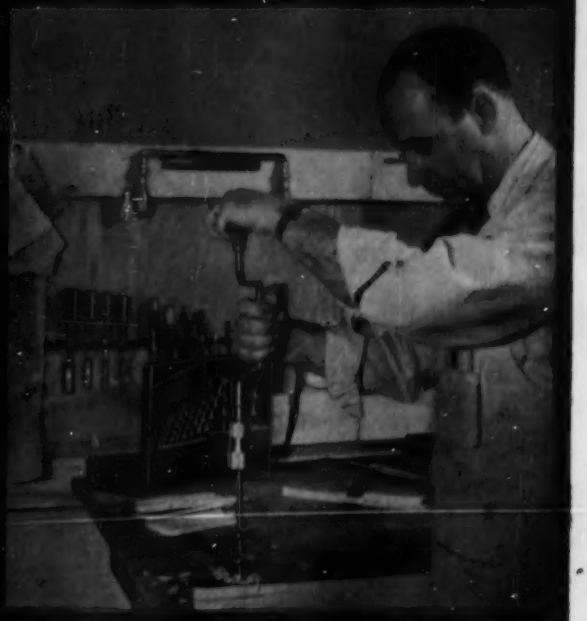
GREENLEE 22 SOLID-CENTER AUGER BITS

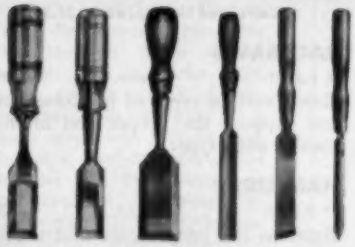
Made with utmost care to assure free, easy boring and fast chip clearance. Solid-center design for extra strength, smooth operation. Accurately sized, perfect cutting edges. "Plastic-Sealed" to reach you factory-sharp. Can be purchased singly or in handy bench sets and steel boxes as shown at right (also in plastic rolls).



Better Shopwork with fine hand tools by GREENLEE

Good workmanship comes easily with GREENLEE tools. All are carefully formed and finished for accuracy and correct cutting edges and are properly heat-treated for long life. They are made by craftsmen for craftsmen.





CHISELS, GOUGES, TURNING TOOLS

Various types of tang butt, socket butt and firmer chisels with durable green plastic or hickory handles. Outside and inside bevel socket gouges. Short and full-length turning tools.

EXPANSIVE BITS, DRILLS, ELECTRIC-DRILL BITS

Fast, easy-boring expansive bits with positive chip clearance. Two styles: Setfast with quick adjusting-locking feature, and Plain type. Wood-boring brace drills and solid-center electric-drill bits in various sizes.

SPIRAL SCREW DRIVERS, PUSH DRILLS, DRAWKNIVES

Free-running, fast action GREENLEE spiral screw drivers are available in two models: Enclosed Spiral for extra safety and grit-free operation, and Open Spiral. Automatic push drills are smooth operating with automatic spring return . . . handle holds eight drill points. GREENLEE drawknives are light in weight and have sturdy, rigid blades for accurate work.

The GREENLEE line also includes many other time-saving tools for students and shop workers: Bit Extensions, Electricians' Bits, Tubing Benders, Radio Chassis Punches, and many more. Write for free catalog No. 35-H.

TOOLS FOR CRAFTSMEN

GREENLEE

GREENLEE TOOL CO.

2023 Twelfth St., Rockford, Illinois

Cut Your Saw Blade Bill with SIMONDS SI-CLONE SAWS

You save 3 ways with Simonds Si-Clone Saws. First of all, you get a high quality, electric furnace alloy steel saw at popular price. Second, you get longer service between sharpenings because Simonds steel holds a keen edge longer. And finally, you get smoother, straighter cuts that need less finishing, save time, mean better work.

What's more, you have a choice of 13 types of saws up to 12" diameter for specific cutting needs, for use on all standard table, radial arm or portable electric hand saw machines.

Get these money-saving saw blades from your hardware or mill supply dealer . . . send for Catalog "B".

Rip, Cut-off and No. 60 Comb.
6" $1.75
7" 2.00
8" 2.15
9" 2.65
10" 3.15
12" 4.35
Supplied with round or special shape holes
GUARANTEE
Made of Simonds steel fully guaranteed against any defect in material or workmanship.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Factory branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.

(Continued from page 32A)

ENAMEL
1. Selected colors
2. Undercoater

FILLERS — paste: natural golden oak, dark oak, and mahogany

FILLETS — leather, ¼ and ½ in.

GLUE
1. Casein, hide, best grade cabinet
2. Liquid

HARDWARE — Brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons, corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports

HOOKS
1. And eyes
2. Cup
3. Screw
4. Square screws

LACQUER — black, clear, cobalt blue, ivory, medium green, red, thinner, white, and yellow

LUMBER — Ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine
In ordering pine, mill run, kiln dried will be found suitable for carpentry, while short, select, kiln dried, 4 in. and wider or No. 1 shop common, kiln dried will be required for cabinetmaking and patternmaking
Hardwood for furniture, should be specified first and second grade, kiln dried, standard widths and lengths, or short lengths

MOLDINGS

NAILS
1. Common, 6d, 8d, and 10d
2. Flathead, ½ in. No. 20, ¾ in No. 19, 1 in. No. 18, 1¼ in. and 1½ in. No. 16, and 2 in. No. 14
3. Finishing, 4d, 6d, and 8d

OIL
1. Linseed, boiled
2. Linseed, raw
3. Machine
4. Rubbing

OVERLAY CARVINGS

PANEL OR PLYWOOD — 3 ply, 5 ply, and 7 ply

PATTERN LETTERS

PINS — escutcheon

PUMICE STONE — No. 0

RAPPING PLATES

ROTTENSTONE

SANDPAPER — Garnet cabinet paper, 3/0, 2/0, 0, ½, 1
Garnet finishing paper, 6/0, 4/0
Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order

SCREW EYES

SCREWS
1. Flathead, brass, No. 3 by ⅜ in., No. 4 by ½ in., No. 5 by ⅝, and ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by

(Continued on next page)

U. S. GOVERNMENT FILMS for top results in SHOP TRAINING

BASIC MACHINES:

THE LATHE
OE 68 *15 min.* *$34.25*
Functions, characteristics, and basic operations of the engine lathe.
(Correlated filmstrip, 49 fr., $1.25)

THE MILLING MACHINE
OE 69 *15 min.* *$34.25*
Functions, characteristics, and basic operations of the milling machine.
(Correlated filmstrip, 41 fr., $1.25)

THE SHAPER
OE 70 *15 min.* *$33.12*
Functions, characteristics, and basic operations of the shaper.
(Correlated filmstrip, 40 fr., $1.25)

THE DRILL PRESS
OE 71 *10 min.* *$24.86*
Functions, characteristics, and basic operations of the drill press.
(Correlated filmstrip, 32 fr., $1.25)

HACKSAWS
TF 9-2031 *18 min.* *$32.98*
Shows various types of hacksaw frames and explains the proper and improper uses of each type.

HAMMERS
TF 9-2029 *11 min.* *$20.31*
Explains the proper care and use of a machinist's ball, straight and cross peen hammer, and a carpenter's claw hammer.

Order through Dept. IA-1, United World Films, Inc. Prices F.O.B. New York City. Special discounts for schools and non-profit organizations. Write for FREE catalog.

UNITED WORLD FILMS, INC.

1445 Park Ave., New York 29, N. Y.

"World's Largest Distributors of 16mm Sound Motion Pictures"

(Continued from previous page)

1¼, 1½ and 2 in., No. 12 by 1¼, 1½, and 1¾ in.
2. Flathead, bright, No. 3 by ½ in., No. 4 by ½ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1, and 1¼ in., No. 10 by 1¼, 1½, and 1¾ in., No. 12 by 1½, 1¾, and 2 in., No. 14 by 2¼ and 2½ in.
3. Oval head, brass, No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., and No. 10 by 1¼ in.
4. Roundhead, blued, No. 3 by ⅜ and ½ in., No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by 1¼, and 1½ in., No. 12 by 1½ in.
5. Roundhead, brass, No. 3 by ⅜ in., No. 4 by ½, and ⅝ in., No. 5 by ¾ in.

SHELLAC
1. Orange, cut 4 lb. to the gal.
2. Sticks, assorted colors
3. White, cut 4 lb. to the gal.

NOTE: Shellac should be kept in glass or earthenware containers

STAINS — oil, spirit, or water. Fumed oak, dark oak, golden oak, light oak, mahogany, and walnut
STEEL WOOL — No. 0 and No. 2/0
TURPENTINE
TWINE
VARNISH — coach, flat, remover, spar, and rubbing
WASTE — cotton, white
WAX — bees and finishing
WHITE LEAD

NEW "HOW-TO-DO-IT" MOVIE

The retail lumber dealer plays the key supporting role in "Operation Attic" the Western Pine Association's pioneering "how to do it" movie released recently. The full-color film, 16mm. and 20 minutes in running time, tells the story of a young couple who wish to finish their attic, how they selected the materials with the dealer's help and advice, and then shows the step-by-step paneling of the attic itself.

"Operation Attic" is the first of a projected series of "how to do it" subjects designed to show the homeowner the simple steps for remodeling and finishing in and around the modern home.

"The Bounty of the Forest," the association's award-winning 28-minute documentary in full color, telling the story of lumber from seedling tree to paneling and other end uses, has been receiving heavy bookings throughout the United States by Retailers, civic groups, schools, and clubs.

Both movies are available for showings by retailers and other interested people.

Your students will enjoy building any of these interesting projects. The clear, easy-to-follow plans—plus big easy-to-work panels—make for professional-like results when you use

FIR PLYWOOD

37 PLANS for classroom projects FREE to industrial arts instructors

CHECK PLANS YOU WANT— MAIL COUPON—THAT'S ALL!

Look for DFPA trademarks—your assurance of DFPA quality-tested fir plywood. PLYPANEL is versatile one-side grade of interior-type fir plywood. For all outdoor uses, insist on EXTERIOR-TYPE; the EXT-DFPA on the panel edge is your positive identification.

INSIST ON DFPA-INSPECTED FIR PLYWOOD

- ☐ UTILITY TABLE
- ☐ STACKING CABINETS
- ☐ BUFFET STORAGE CABINET
- ☐ UTILITY SHELVES
- ☐ TOOL-CABINET WORKBENCH
- ☐ DOUBLE DUTY DESK
- ☐ COFFEE TABLE
- ☐ BEDSIDE TABLE
- ☐ STUDENT'S DESK
- ☐ CHEST OF DRAWERS
- ☐ TWO-DOOR CABINET
- ☐ TV STOOLS
- ☐ CHILD'S TUMBLER
- ☐ CHILD'S TABLE AND STOOLS
- ☐ BUNK BED
- ☐ BOAT BED
- ☐ TRAIN TABLE CABINET
- ☐ COVERED SAND BOX
- ☐ TOY STORAGE BLOCKS
- ☐ PORTABLE GARDEN CADDY
- ☐ SECTIONAL PATIO TABLES
- ☐ OUTDOOR SERVING WAGON
- ☐ SUN SLED
- ☐ GARAGE STORAGE BOX
- ☐ GARDEN CABINET
- ☐ PATIO FURNITURE
- ☐ ODDS 'N ENDS CABINET
- ☐ 15' SAILBOAT
- ☐ 20' SAILBOAT
- ☐ 11'3" OUTBOARD
- ☐ 9' FLAT BOTTOM DINGHY
- ☐ 7'9" PRAM DINGHY
- ☐ 13'4" OUTBOARD
- ☐ 13'6" INBOARD RUNABOUT
- ☐ HOG HOUSE
- ☐ POULTRY HOUSE
- ☐ ROLL-AWAY POULTRY NEST

DOUGLAS FIR PLYWOOD ASSOCIATION, DEPT. IA, TACOMA 2, WASH.

Without obligation or charge, please send me a copy of the plans I have checked above.

NAME.....

SCHOOL.....

ADDRESS.....

CITY.....ZONE....STATE.....

(Good in USA Only)

AUTOMOTIVE EQUIPMENT

(Continued from page 26A)

FUSES — automobile Nd. 3 ag, 20 amp.
GASOLINE — commercial grade (as needed)
GAUGE (thickness gauge)
1. .002" thickness, ½" width, ground thickness gauge stock
2. .003" thickness, ½" width, ground thickness gauge stock
3. .005" thickness, ½" width, ground thickness gauge stock
4. .010" thickness, ½" width, ground thickness gauge stock
5. .015" thickness, ½" width, ground thickness gauge stock

GREASE
Chassis, purchase in quantity depending on amount used
GRINDING COMPOUND
2 compartment oil mixed grades A & E
GRINDING WHEELS
When requesting grinding wheels for replacement purposes, be sure to specify the material bond, grain, size, and hardness or grade
HANDLE, HAMMER
1. 14" length, 16 oz. machinist's
2. 18" length, 24 oz. machinist's

HOSE
1. ¾", rubber, 2 ply, 50' lengths
2. Radiator hoses are molded for specific cars

HOSE CLAMPS
Universal type, to fit 1" to 3" O.D. hose
HYDRAULIC BRAKE FLUID
HYDROMETER FLOATS
1. Automobile storage battery, hydrometer float only
2. Automobile radiator hydrometer float only, calibrated for alcohol, glycerine, and prestone

INSULATOR
1. Rubber to fit mueller No. 85 clips, red mueller No. 87
2. Rubber to fit mueller No. 85 clips, black mueller No. 87

NUTS, MACHINE SCREW
1. No. 6-32, hex, steel
2. No. 8-32, hex, steel
3. No. 10-24, hex, steel

NUTS
1. ¼"-20 hex, semifinished
2. 5/16"-18 hex, semifinished
3. ⅜"-16 hex, semifinished
4. 7/16"-14 hex, semifinished
5. ½"-13 hex, semifinished
6. ¼"-28 hex, semifinished
7. 5/16"-24 hex, semifinished
8. ⅜"-24 hex, semifinished
9. 7/16"-20 hex, semifinished
10. ½"-20 hex, semifinished

NUTS
1. ¼"-28 castellated hex, semifinished
2. 5/16"-24 castellated hex, semifinished
3. ⅜"-24 castellated hex, semifinished
4. 7/16"-20 castellated hex, semifinished
5. ½"- castellated hex, semifinished
6. ¼"-20 castellated hex, semifinished
7. 5/16"-18 castellated hex, semifinished
8. ⅜"-16 castellated hex, semifinished
9. 7/16"-14 castellated hex, semifinished
10. ½"-13 castellated hex, semifinished

OIL — S.A.E. No. 30, engine oil (as needed)
PAINT (for shop maintenance)
1. Black, quick drying enamel
2. Red, quick drying enamel
3. White, quick drying enamel
4. Machine enamel, gray

PANS
Automobile drain pans, approximately 3 gallon capacity, height not to exceed 5", galvanized
PLUGS
1. Attachment, molded soft rubber two prong, body only
2. Attachment cap only
3. Three prong for grounding

RAGS
Wiping, bleached and washed. (Some schools may prefer to use wiping rags supplied and washed by a local laundry service)
SAFETY WASHERS (grinding wheel)
Order by pair, specify arbor size and diameter flange for grinding wheels
SALAMMONIAC — for cleaning soldering coppers
SANDPAPER
1" width, No. 00, 50 yd. roll for commutators
SCREWS, MACHINE
No. 6-32 x 1", round head
No. 8-32 x 1½", round head
No. 10-24 x 2", round head
SCREWS, CAP
¼"-20 x 1¼", hex.
5/16"-18 x 1½", hex.
⅜"-16 x 1¾", hex.
½"-13 x 2", hex.
¼"-28 x ¾", hex.
5/16"-24 x 1¼", hex.
⅜"-24 x 1½", hex.
7/16"-20 x 1½", hex.
½"-20 x 2", hex.
SHELLAC — white, 4 pound cut.
SOCKETS, LIGHT
1. Dash light, double contact, 6 volt
2. Dash light, single contact, 6 volt

(Continued on page 42A)

large face plate turning
chucking operations
parts finishing
metal spinning
wood turning
taper turning
deburring
polishing
lapping

for a greater variety of projects use
The BLOUNT VS-55 LATHE

You can plan to do more projects, different projects with the really versatile VS-55 Lathe. This economical lathe for both woodturning and metal spinning handles a 12" swing over the main bed . . . 16" swing over gap . . . rear face plate swings large pieces for turning.

Safe, simple operation . . . Speed control interlocked with "start" switch . . . built-in tool storage . . . wooden shelf protects cutting tool edges.

Plan now to have a Blount VS-55 Lathe in your shop . . . leading schools throughout the country have made it their choice. For details, ask for Bulletin SD-14.

J. G. Blount COMPANY, 21 WOODLAND STREET, EVERETT, MASS.
Manufacturers of Wet Tool Grinders, Woodturning and Metal Spinning Lathes

be sure you're there!

Enroll today in an accredited

DELCO-REMY COURSE IN AUTOMOTIVE ELECTRICITY

June 18-29 • July 16-27 • August 13-24 • 1956 • Anderson, Indiana

If you're a vocational instructor in AUTOMOTIVE ELECTRICITY, here's an opportunity you won't want to miss!

As part of the automobile industry's contribution to the vocational training field, Delco-Remy Division of General Motors offers you the chance to gain new ideas and fresh material, and a recheck on fundamentals, during *tuition-free* summer courses in Automotive Electricity. And, what's more, many colleges and universities will now give credit for attendance at these schools! (Complete details are available on request.)

Among subjects to be discussed are electricity and magnetism, batteries, cranking motors, ignition systems, generators and generator regulators, as applied to automotive equipment. To supplement theoretical studies, the course will also include practical work in the school shop and excursions through Delco-Remy manufacturing plants.

Enroll now. Complete and mail the coupon today. Full details of the courses, living arrangements, etc., will be sent to you promptly. Please number your 1st, 2nd, and 3rd choices of dates.

MR. F. P. PLOVICK, Manager of Field Service
DELCO-REMY, DIVISION OF GENERAL MOTORS
ANDERSON, INDIANA

Dear Sir: I am interested in attending the 1956 Delco-Remy Course in Automotive Electricity. My preference for courses is as follows:

■ JUNE 18-29 ■ JULY 16-27 ■ AUG. 13-24

NAME _____

SCHOOL _____

SUBJECT TAUGHT _____

MAIL ADDRESS _____

Electrical-Shop Equipment, Supplies, and Motor Testing Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

BENCH GRINDER

BENCHES — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets

BITS
1. Auger, ¼ in. to 1 in. by 16ths
2. Auger, 1 1/16 in., 18 in. long
3. Drill, for wood, square shank, ⅛ in. to ½ in. by 16ths
4. Expansion
5. Extension, 18 in.
6. Screw driver, ¼ in.

BLACKBOARD — permanent or portable

BLOWTORCHES — 1-qt. size

BOOKCASE

BRACES — ratchet type, 8-in. swing

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, etc.

CHAIRS — teacher's and tablet arm

COMPASS SAW

COIL
1. Spreader
2. Taper
3. Winder

DESK — teacher's, with drawer compartments

DRILL
1. Breast
2. Concrete, ¾ in., ½ in., ¾ in., 1 in.
3. Hand
4. Portable, electric
5. Twist, 1/32 in. to ½ in. by 64ths

DRILL PRESS
1. Bench, hand, or power driven
2. Heavy, power driven

FILES

FIRST-AID CABINET AND SUPPLIES

HACK SAW
1. Blades, 10 in., 24 tooth
2. Frames adjustable

HAMMERS
1. Claw, 12 oz.
2. Machinist's, ball peen

HICKEY — ½ in. and ¾ in.

LATHE
1. Engine, 10-in. or 12-in. swing, 6 ft. or 8 ft. long
2. Speed

PLIERS
1. Gas, 6½ in. and 8 in.
2. Side cutting, 6 in.

PUNCH — for metal molding

PUNCHES — assorted

REAMERS
1. Pipe Burring, ¼ in. to 1 in.
2. Pipe burring, ½ in. to 2 in.

RULES
1. 48 in. zigzag
2. 72 in. zigzag

SCREW DRIVERS — 3 in., 5 in., and 8 in.

SHEARS — for cutting metal molding

SOLDER DIPPERS

SOLDERING COPPERS
1. Assorted
2. Electric
3. Handles

STOCKS AND DIES — for Pipe threads, ½ in. to 1 in.

VISES
1. Machinist's, 4 in.
2. Pipe

WRENCHES
1. Adjustable, 6 in. and 8 in.
2. Pipe, 10 in., 12 in., and 14 in.
3. Socket, combination

Electrical Shop — Supplies

ABRASIVE CLOTH — Aluminum oxide, 1, 1½, and 2 in. wide

ARMORED CABLE
1. 2 wire, No. 14, single strip
2. 3 wire, No. 14, single strip
3. Box connectors

ATTACHMENT PLUG

BAR HANGERS

BATTERIES — dry cells

BATTERY ACID — 1.300

BATTERY SEALING COMPOUND

BOX CLEATS

BRADS — ¾ in., No. 19 and 1½ in., No. 16

BRAKE LINING — ⅛ by 2 in.

BRUSHES — Carbon, for motors and generators

BURGLAR CONTACTS
1. Open circuit
2. Closed circuit

BUSHINGS
1. Loom, No. 1 and No. 2
2. "Jiffy" loom, No. 2

BUZZERS

CLEATS — unglazed porcelain, 2 wire

CLIPS — test, with insulators, Universal, Nos. 22, 23, 24 and 25

COMMUTATOR CEMENT

CONDUIT
1. Bushings, ½, ¾, and 1 in.
2. Box connectors, for flexible
3. Couplings, for flexible
4. Lock nuts, ½, ¾, and 1 in.
5. Rigid, ½, ¾, and 1 in.

CONDULET
1. Fillings, ½ in., LL, LR, and LB
2. Covers, ½ in., blank

DOOR OPENERS — mortised

FISH PAPER — .0125 in. thick

FIXTURES — brass, chain, suspension

FIXTURE STUDS

FUSES
1. Plug type, renewable, 125 volt, 15 amp.
2. Cartridge type, renewable, 125 volt, 30 amp.
3. Renewals for plug fuses
4. Renewals for cartridge fuses

GROUND CLAMPS — ⅜ to 1 in. assorted

HICKEY GRIPS — ½ and ¾ in.

LAMPS
1. Mazda, selected as wattages and voltages
2. Guards for brass sockets

LEATHER NAIL HEADS

LUGS — 25 and 50 amp.

LUMBER — 2 by 4 in. by 14 ft., No. 1, white pine dressed, 4 sides

MOLDING
1. Metal
2. Metal, fittings — crosses, T's, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches

NAILS — roofing

NUTS — iron, 4-36, 6-32, 8-32, 10-24, 12-24, 10-32, 14-20

OUTLET BOXES — 4 in. square, with one round blank cover, and one cover with bushed opening

PIPE STRAPS — galvanized, ⅜, ½, ¾, and 1 in.

PUSH BUTTONS
1. Return call, 3 point
2. Single

RECEPTACLES
1. Flush, duplex
2. Porcelain cleat, 660 watt, 250 volt
3. Concealed
4. Covers

RECTIFIERS — Tungar, for charging from 1 to 12, 6- and 12-volt batteries

RELAYS — Dixie

RESISTANCE BOARDS — for testing

RESISTANCE UNITS — 125-ohm

RHEOSTATS
1. Compression, 275 watt
2. Field, for shunt and compound motors

ROSETTES — wood

ROTARY CONVERTER — 5-kw. capacity, 3 phase a.c., 110 volt d.c.

SCREWS
1. Anchors, 8/32, 10/24, 12/24, 14/20
2. Machine, roundhead, 4-40 by ¼ in., 6-32 by ½ in., 6-32 by ¾ in., 8-32 by ⅝ in., 8-32 by ½ in., 8-32 by 1 in., 10-32 by ⅝ in., 10-24 by ⅝ in., 10-24 by ¾ in., 10-32 by ⅝ in., 12-24 by 1 in.
3. Machine, brass, roundhead, 4-40 by ¼ in., 6-32 by ½ in., 6-32 by ¾ in., 8-32 by ½ in.
4. Wood, flathead bright, No. 5 by ¾ in., No. 8 by ½ in., No. 8 by ¾ in., No. 8 by 1 in., No. 7 by 1½ in., No. 8 by 1½ in., No. 7 by 2 in.
5. Wood, roundhead blued, No. 7 by 1 in., No. 8 by 1½ in., No. 10 by 1½ in., No. 7 by 2 in.

SLEEVING — No. 1, white; No. 1, blue; and No. 1, red

SOCKETS
1. Brushed, brass pull chain, keyless, key
2. Porcelain, keyless, with caps
3. Porcelain, key, with caps

SOCKET CAPS — ¼ and ⅜ in. bushed

SOLDER WIRE — 50/50 size, No. 10

SOLDERING PASTE — 2 oz. cans, noncorrosive

SOLDERING SALTS — 1-oz. cans, noncorrosive

SPEED COUNTERS — 0-9999

SPLIT KNOBS — porcelain

SPRING BALANCES — 0-30 lb.

STARTING BOXES
1. For compound motors, various makes
2. For shunt wound, 1 h.p., 110-volt motors. Overload release
3. For shunt wound, 1 h.p., 110-volt motors. No voltage release
4. Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors

STORAGE BATTERIES — 6 volt

SWITCH
1. Battery, 4 point
2. Bases, porcelain, for 10-amp. switches
3. Boxes, 2¼ in. deep
4. Entrance, safety, 2 pole, 30 amp., with 2-branch lighting circuits
5. Entrance, safety, 3 pole, 30 amp., 250 volt
6. Flush, push button, S.P., D.P., 3 way, 4 way
7. Surface, S1, S3, and S4
8. Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
9. Surface, snap, electrolier
10. Surface, snap, S.P.D.P., 3 way, 4 way

SWITCHBOARD — as required

TACKS — double-pointed No. 10

TAPE
1. Friction, ½-lb. rolls
2. Rubber, ½-lb. rolls

TELEGRAPH SETS — including sounders, keys, and relays

TELEPHONES
1. Complete bridging, independent phones
2. Couch vestibule telephones
3. Receivers, transmitters, induction coils, condensers, and bridging switch hooks

(Continued on page 41A)

WELDED ALL-STEEL LONG TABLE JOINTERS

The longest fences of any 6" or 8" jointers. The longest tables of any 8" jointers. The only long-table jointers with full-length, front-adjusting, double-locked fences.

HELMET HEAD DRILL PRESSES

Over 50 Models—Durable. Sensitive. Larger, longer quills for heavier thrust loads and accurate deep hole drilling and tapping. Involute six-tooth spline drive for freedom from vibration. Balanced for high speeds for reduced drill breakage.

24" x 5" HEAVY DUTY JIG SAW

Cuts plumb when sawing curves. 20" x 20" table. Wider range tension control. Cuts materials up to 5" thick. Handles blades 5" to 9" long. 50% longer blade stroke cuts faster.

SAW-JOINTER WITH TILTING ARBOR SAW

Blade, not table, tilts. Unique drive permits mounting motor rigidly and separately. Cuts, miters, planes, rabbets, grooves. Longer table and fence. Perfect work on longer stock.

10" TILTING ARBOR SAW

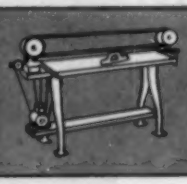
Can be driven by *standard* motors, even gas engine or line shaft, by using "rolling drive pulley." Motor is entirely separate and away from dust, keeping vibration from the arbor.

HEAVY DUTY 12" x 4" THICKNESS PLANER

50% faster. Powered for output of 14 feet per minute. Planes materials as short as 6½"; hard woods down to ⅛" thick. Built to last on hard jobs.

14-INCH HIGH SPEED BAND SAW

Saws 2 to 4 times faster. Single and 8-speed back geared models for cutting practically any material smoothly and accurately. High safety rating. Tremendous strength.



BELT SANDER-GRINDER

Lowest cost, most compact mill type, hand stroke. Serves as drum sander on contours and irregular shapes. Work is always face up, eliminating guesswork and saving time.

SPINDLE SHAPER

The only shaper having ½" and ¾" cutting arbors formed on a solid one-piece spindle. Stronger. Truer running. Safer. Runs wide mouldings and raised panels in one cut.

SPINDLE SANDER

Sands wood and grinds plastics and metals up to 6" thick, straight and exterior and interior contours to as sharp a radius as ½" and all bevels 0 to 45°.

FRICTION-MATIC WET TOOL GRINDER

Self-adjusting friction roll drive. Peripheral speed remains constant as wheel wears. No water thrown on operator. Larger adjustable tool rest, mounted above grindstone for comfortable operating position and control of pressure.

COMBINATION CONTOUR SAW AND BAND FILER

Ups production as much as 1000%. Accurate. Rugged. Precision filing and file broaching as well as cutting. 8 speeds instantly available—4100 blade f.p.m. down to 92 blade f.p.m.

GAP-BED LATHES

(17" dia. Gap Swing) for wood turning and metal spinning. 55% greater capacity without extra cost. All wanted features, plus longer center capacity and stronger all-steel beds. Two models, 42" and 60" c. to c.

You

CAN EASILY DO JOBS

of cutting - shaping - drilling finishing

- **WOOD**
- **METAL**
- **PLASTIC**
- **FIBRE**

with these 13 low cost, high quality

Boice-Crane

INTERMEDIATE CAPACITY POWER TOOLS

Use Coupon To Get Free Catalog

BOICE-CRANE COMPANY

932 Central Avenue Toledo 6, Ohio

Please send free catalog on complete line of Boice-Crane Power Tools.

See our catalog in AMERICAN SCHOOL AND UNIVERSITY or write for copy

Name .....

School .....

Street .....

City & State .....

TRAIN YOUR STUDENTS ON MACHINES OF MODERN INDUSTRY

RACINE "Utility" HYDRAULIC METAL SAWS

Easy to demonstrate!

Here's the ideal metal-cutting saw for vocational training . . . ideal because it is the same type machine used by modern industry . . . ideal because it requires only minimum maintenance.

VERSATILE — Racine's "Utility" metal-cutting saw is a durable performer in all metals from soft tubing to hard alloy steels up to 6" x 6". Available in Wet or Dry Cut models.

ACCURATE — ECONOMICAL — Assures important savings in materials and blades.

STURDY — Built to "take it" . . . in industry and in the school shop.

EASY TO OPERATE — Hydraulic operation provides simplified, trouble-free operation. Pressures are controlled by single graduated dial.

PROVEN — The first choice of leading schools and industries, backed by more than 4 decades of progressive experience in the manufacture of precision machines for training and industry.

Write us about your training machinery needs. Also ask for our complete metal saw line catalog. Address RACINE HYDRAULICS & MACHINERY, INC., 2080 Albert St., Racine, Wis.

RACINE

RACINE HYDRAULICS & MACHINERY, INC.
RACINE, WISCONSIN

Perfect for the school shop

RUGGED! ECONOMICAL!

A Queen City pedestal or bench Grinder is a wise choice for the school shop. It has the features and performance of industrial grinders: repulsion-induction motor, fully enclosed; rugged bearings and guards; high quality switches and cords . . . yet the price is 20 to 30% less!

Queen City's new ¾ H.P. Bench or Pedestal combination Grinder and Buffer fits all school shop requirements perfectly. Find out why Queen City Grinders have been used in vocational training for over 30 years. Available from ⅓ H.P. on up.

QUEEN CITY MACHINE TOOL COMPANY

3916 Kellogg Avenue Cincinnati 26, Ohio

Write for FREE Literature

FINGER-TIP Controlled POWER

For 'Small-Work' Finishing Jobs!

Foredom FLEXIBLE SHAFT MACHINES

VERSATILE

And INEXPENSIVE TOO!

BROAD RANGE OF ACCESSORIES!

Here are just a few of the many accessories listed in our catalog to make your employment of FOREDOMS pay DIVIDENDS!

7 HANDPIECE TYPES!

Pencil size or larger! Featherweight, high output, instantly interchangeable, reduced fatigue, superior workmanship and unmatched versatility!

***WRITE FOR COMPLETE NEW CATALOG* No. S35C**

Students trained in the use of Foredoms find the experience gained a valuable asset when they start their careers.

Foredom ELECTRIC COMPANY Dept. 535C
27 Park Place, New York 7, N. Y.

(Continued from page 38A)

TRANSFORMERS
1. Bell ringing, 6, 8, 14 volt
2. Single phase, 110–220 volt, S.K.V.A.

TUBES — porcelain, 5/16 by 3 in., 5/16 by 5 in., and 5/16 by 10 in.

TUBING — flexible nonmetallic, ¼ and ⅜ in.

WASHERS
1. Iron, ¼ and ⅜ in.
2. Brass, ¼ and ⅜ in.

WIRE
1. Annunciator No. 18 or No. 20
2. Fixture, No. 18, single yellow, with marker
3. Rubber covered, solid copper, No. 10, black
4. No. 10, white
5. No. 14, black
6. No. 14, white
7. Rubber covered, No. 16, brewery cord
8. No. 18, lamp cord, green and yellow
9. S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop — Motor and Testing Equipment

ANNUNCIATORS
1. Automatic needle drop
2. Gravity drop
3. Manual needle drop

ARMATURES — burnt out, for repairing

BATTERY CHARGER — commercial

CIRCUIT BREAKERS
1. Air, single pole, overload, 25 amp., 550 volt
2. Air, single pole, underload, 15 amp., 550 volt

CONTROLLERS
1. For multiple-speed motor
2. For 1 h.p., 110-volt series motors

GENERATORS
1. Motor-generator set, 10 h.p., to supply 110-volt d.c. for testing purposes, battery charging, etc.
2. Generator, 6-volt d.c. coupled to an a.c. motor for 6-volt circuit testing
3. Auto generators of different makes

GRAVITY CELLS

MAGNETS — testing, 10,000 ohm

METERS
1. Ammeter, standard, 60 amp., a.c.
2. Ammeter, standard, 60 amp., d.c.
3. Ammeter, student, 60 amp., a.c.
4. Ammeter, student, 60 amp., d.c.
5. Voltmeter, standard, 0–10 volt, d.c.-a.c.
6. Voltmeter, standard, 110–220
7. Voltmeter, standard, 125 volt
8. Voltmeter, standard, 125 volt, d.c.
9. Voltmeter, student, 110 volt, d.c.
10. Voltmeter, student, 110 volt, a.c.
11. Wattmeter, standard, 110–220 volt, 30–60 amp., d.c.-a.c.
12. Wattmeter, student, 110–220 volt, 30 amp., a.c.-d.c.
13. Watt-hour meter, 125 volt, 5 amp., a.c., single phase, various makes

MOTORS
1. Auto starter, different makes
2. Burnt out, fractional h.p., 110 volt, 60 cycle, for repairing
3. Compound, 1 h.p., 110 volt, d.c.
4. Multiple speed, 1 h.p., 3 phase, 220 volt
5. Series, 1 h.p., 110 volt, d.c.
6. Shunt, 1 h.p., 110 volt, d.c.
7. Split phase and repulsion, a.c., 110 volt, single phase, assorted
8. Split phase induction motors, fractional h.p., 110 volt, 60 cycle, different makes
9. 3 phase, 1 h.p., a.c., 220 volt, various makes
10. 3 phase, 2 h.p., 220 volt, a.c., various makes
11. Universal, fractional h.p., 110 volt, different makes
12. Universal, variable speed, ½ h.p.

PLATFORM SCALE — 100 lb. capacity

The Crow Electri-Kit for Beginners and the Crow Basic Electronics Kit have brought electricity and electronics into thousands of schools . . . schools where these subjects were long considered too difficult or too expensive to teach.

Now Crow brings you Model 53—a unique *Advanced Electronics* kit. This "learn-by-doing" kit gives your students penetrating insight into the fascinating world of Radio Transmitting and Receiving, Industrial Electronic Controls, Electron Tube Theory, and Basic Radar and TV.

With the kit's 108 components, students *build their own operating assemblies.* A correlated, 400-page work manual gives complete directions for assembly plus historical background and practical applications of each experiment. Written in simple language using only elementary mathematics, the manual permits teachers with limited technical training to teach the course easily.

Model 53 is the comprehensive, common-sense way to practical electronic knowledge, yet its cost is remarkably low. The complete kit as shown above—*nothing else to buy*—costs only $155. *Write for illustrated folder.*

CROW ELECTRI-CRAFT CORPORATION

Division of Universal Scientific Co., Inc. • Box 3366 • Vincennes, Indiana

Howard W. Sams BASIC MANUALS...

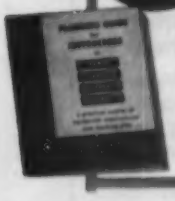
most widely used courses for effective instruction in RADIO, TV, ELECTRONICS & ELECTRICITY

NEW "BASIC TELEVISION MANUAL"

Here is the most comprehensive and valuable training course, planned to help the instructor in Television achieve maximum teaching effectiveness. The Manual is organized in two sections as follows: LESSON SECTION: 24 lessons covering such subjects as Oscilloscope principles and application; power supplies; FM carrier waves, discriminators, ratio detectors; antenna principles and design; Television receivers; RF amplifiers and tuners; Video IF, detector and AGC; cathode ray picture tubes; sweep circuits, and other subjects—meets every need for complete, effective instruction in TV. PROJECT SECTION: Describes nine basic projects which demonstrate theory in action; these projects are designed to sustain interest while teaching through actual, practical doing. Manual contains 280 pages; profusely illustrated; 8½ x 11". Order SD-21, only $5.00

"BASIC RADIO MANUAL"

This is the widely used, comprehensive Training Course in Radio. Includes 36-Lesson Section covering basic radio theory, terms, circuits and symbols, components, test instruments, radio transmitting and receiving principles, etc. The 13-Project Section demonstrates theory in practical action by actual doing; includes construction projects, application of basic laws, soldering practice, demonstration of components, construction, etc. Adopted as standard text by hundreds of schools for practical, effective training in Radio. Manual contains 248 pages; fully illustrated. 8½ x 11". Order SD-1, only $5.00



FREE

NEW "PLANNING GUIDE FOR INSTRUCTORS"

This FREE 24-page Sams' booklet offers invaluable help for instructors in Radio, TV and Electricity. Provides a practical outline of equipment requirements, teaching aids and shop bench design. Includes important data on basic test equipment. You'll want this helpful guide to plan and organize a successful shop course. FREE to instructors on request—write for it now.

"BASIC ELECTRICITY MANUAL"

This outstanding training course in Electricity is planned to help the instructor achieve maximum teaching effectiveness. Consists of 35 Lessons in Practical Electricity, covering basic theory, laws, terms, magnetism, motors, transformers, lighting, telephones and dozens of other subjects. Includes 13-Projects Section, outlining simple, inexpensive projects which demonstrate theory in practical action and which teach interestingly through actual doing. Manual contains 264 pages; profusely illustrated; 8½ x 11". Order SD-12, only $5.00

HOWARD W. SAMS & CO., INC.
Indianapolis 5, Indiana

Order Your SAMS MANUALS TODAY!

HOWARD W. SAMS & CO., Inc., 2218 E. 46th St., Indianapolis 5, Ind.
Send me the following (with 30-day return privilege):
☐ copies "Basic Television" ($5). ☐ copies "Basic Radio" ($5)
☐ copies "Basic Electricity" ($5). ☐ FREE "Planning Guide"
$.....enclosed. .....Bill as instructed.
Name.....*Title:*.....
School.....
Address.....
City.....*Zone*.....*State*.....

AUTOMOTIVE EQUIPMENT

(Continued from page 36A)

SOLDER, PASTE — all purpose, noncorrosive

SOLDER, WIRE
No. 5 spools, ⅛" diameter, 50-50 alloy

SPARK PLUGS
1. 14 millimeter metric
2. 18 millimeter metric

STAPLES — insulated, ½"

TAPE
1. ¾" friction tape
2. ¾" rubber tape

TIRE REPAIR KIT
Garage size, red, 450 sq. in., ¼ pint cement

TIRE REPAIR CEMENT
½ pint can with brush in can

THERMOMETERS (Lab.)
Calibration 10° F.–220° F., 12" length, glass stem

TUBING FITTINGS
1. Flare nuts, 7/16" x 20 for ¼" sae flared fittings
2. Half union, ¼" sae flare x ⅛" standard pipe
3. Shut-off cocks, ¼" D.D. tubing on each end, compression type
4. Shut-off cocks, ¼" D.D. tubing on each end, sae flare type
5. Unions, ¼" compression type x ½" compression type
6. Unions, ¼" sae flare x ¼" flare
7. Unions, 5/16" sae flare x 5/16" flare
8. Unions, 5/16" compression type x 5/16" compression type
9. Shut-off cocks, 5/16" O.D. tubing on each end, compression type
10. Shut-off cocks, 5/16" O.D. tubing on each end, sae flare type
11. Sleeves, 5/16", compression sleeves
12. Nuts, 7/16" x 20 nuts for ¼" O.D. compression fittings
13. Flare nuts ½" x 20 for 5/16" sae flared fittings
14. Half union, ¼" tubing size, compression x ⅛" standard pipe
15. Half union, 5/16" tubing size, compression x ⅛" standard pipe
16. Sleeves, ¼" compression sleeves

TUBING
1. ¼" O.D. annealed copper, automotive
2. 5/16" O.D. annealed copper, automotive
3. 2¼" O.D. flexible metal, galvanized steel for exhaust lines

WASHERS, FLAT
1. ¼", 18 gauge thickness
2. 5/16", 16 gauge thickness
3. ⅜", 16 gauge thickness
4. 7/16", 14 gauge thickness
5. ½", 14 gauge thickness

WASHERS, LOCK
1. ¼"
2. 5/16"
3. ⅜"
4. 7/16"
5. ½"

WIRE
1. No. 18 single strand copper, cotton covered
2. No. 24 single strand copper, single cotton and enamel covered
3. Resistance wire, chromel No. 27, 3.25 ohms per ft.
4. Bonding wire, annealed iron, stove pipe No. 16

Hand Tools

Numerous hand tools are needed in an auto shop since this is a service trade. Tools should be the type used currently in the trade and should be sturdy, simple and practical. In purchasing tools, particular attention should be given to the alloy content, heat treatment, and guarantee.

(Continued on page 52A)

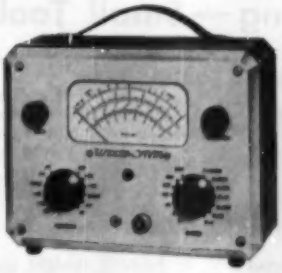
THE 980 LINE

Model 985 Calibrator—$199.50

Model 983 Oscilloscope—$329.50

Model 984 Sweep Generator—$199.50

. . . a new line of test instruments which combine precision and versatility with low cost . . . making them ideally suited for radio and TV school shops, electronics courses and laboratory requirements. Literature on these and other Weston Instruments is available to school instructors on request. Also available, at no cost, is the well-known Weston *Instrument Sketchbook*, and a series of *Instrument Wall Charts* in convenient size. Write to . . . Educational Department, Weston Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, N. J. — *a subsidiary of Daystrom, Incorporated.*

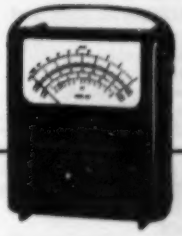


Model 982 Vacuum Tube Voltmeter—$89.50

WESTON

TEST EQUIPMENT

Model 981 Tubechecker—$199.50



Model 980 Analyzer—$42.50

Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

AIR COMPRESSORS — for machine shop, foundry, or forge shop
ANVIL — 100 lb.
ARBOR PRESS — bench or pedestal type
BARROWS
1. Coke
2. Foundry
3. Scrap
BELT LACER
BENCHES
1. Coremaking
2. For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¾ in. to 2½ in. thick
3. Molding
BLOWERS — for furnaces, forges, etc.
BLOWTORCH — 1-qt. size
BOOKCASE — for reference books, catalogs, etc.
BORING BAR
BORING MILL — vertical or horizontal
BULLETIN BOARD
CABINETS — Wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
CASEHARDENING BOXES
CENTERING MACHINE
CHAIN HOISTS — differential, duplex or triplex
CHAIRS — Teachers', and tablet arm if needed for related-subjects room, or for demonstration section
CHALKBOARDS — permanent or portable
CHUCK
1. Drill, selected sizes
2. Lathe, combination, 4 jaw, selected sizes
3. Lathe, independent, 4 jaw, selected sizes
4. Lathe, universal 3 jaw, selected sizes
5. Milling machine, universal
CORE OVEN — for foundry
CRANES AND HOISTS — air, electric, or hand; of the jib, traveling, or portable type
CUPOLA — for foundry, coke, or electric, ¼- to 1-ton capacity
DESK — teacher's, with drawer compartments
DIE-FILING MACHINE
DIVIDING HEAD
DRILLS
1. Bench, hand
2. Breast
3. Electric, portable
4. Hand
5. Post, hand or power
6. Radial
7. Sensitive
8. Upright, power
FLASKS — 2 or 3 part, steel or snap type
FORGE — coal or gas, with hand- or electric-driven blower
FURNACES
1. Annealing
2. Bench
3. Brass and soft metal
4. Combination bench
5. Casehardening
6. Cyanide
7. Gasoline
8. Heat-treating
9. Melting
GEAR-CUTTING MACHINE
GRINDER
1. Bench, hand or power driven
2. Combination grinder, buffer, and polisher
3. Emery, bench or pedestal type
4. Face, with magnetic chuck
5. Portable tool post
6. Precision, for external and internal grinding
7. Universal tool cutter, drill and reamer grinder
8. Wet tool
HACK SAW — motor or belt driven
HAND PICKS — for cleaning inside of cupola, 1¼ to 2½ lb.
HARDNESS TESTING MACHINE
LATHES — belt or individual drives
1. Automatic
2. Bench, 6-in. to 11-in. swing, 11 in. to 36 in. between centers
3. Change gear, 9-in. to 14-in. swing, 18 in. to 36 in. between centers
4. Quick-change gear, 9-in. to 16-in. swing, 18 in. to 36 in. between centers
5. Semiquick-change gear, 9-in. to 18-in. swing, 18 in. to 42 in. between centers
6. Turret
7. Metal spinning
MILLING MACHINE
1. Plain, cone or motor-driven type
2. Universal, cone or motor-driven type
NIBBLING MACHINE
PIPE CUTTER
PLANER — belt or motor driven
POWER HAMMER — for forging operations
PUNCHES — metal, hand, or power
PYROMETER
PYROSCOPE
RELIEVING ATTACHMENT FOR LATHE
SAND SIFTER — for foundry, hand or power
SANDBLAST OUTFIT — with CABINET
SCALE
1. Counter for machine shop
2. Platform, for foundry, 1000-lb. capacity
SHAPER
SNAP-FLASK JACKETS — to fit snap flasks used
STRAIGHTENING PRESS
SURFACE PLATES
SWAGE BLOCK AND STAND — for forge shop
TAPER ATTACHMENT FOR LATHE
TRUCK — warehouse
TUMBLING BARREL — for foundry
VISES
1. Blacksmith
2. Drill press
3. Machinist
4. Pipe
5. Planer
6. Shaper
WELDING OUTFIT
1. Acetylene
2. Electric

Metalworking — Small Tools

ARBORS
1. Drill chuck to suit requirements
2. Reamers, various sizes
3. Shell tool, various sizes
4. Straight shank for shell reamers and shell drills, selected sizes
5. Taper shank for shell reamers and shell drills, selected sizes
BEARING SCRAPER
BELLOWS — for foundry class
BEVEL PROTRACTOR
BROOMS AND FLOOR BRUSHES — for shop and foundry
BRUSHES
1. Bench
2. Core box
3. Core painting
4. Hard brushes for foundry
5. Floor
6. Soft brushes for foundry
BULB SPONGES — for molders
CAKE FORKS — for foundry
CALIPERS
1. Hermaphrodite, 4 in. and 6 in.
2. Inside, 4 in. and 6 in.
3. Outside, 4 in. and 6 in.
CANS
1. Oil, ½ pt., 1 pt., and 10 gal.
2. Waste
CENTER TESTERS
CHISELS
1. Cape, 3/8 and 5/8 in.
2. Cold, 5/8 and 3/4 in.
3. Diamond point, 3/8 and 1/2 in.
4. Roundnose, 1/4 and 1/2 in.
CLAMPS
1. 4, 6, 8, and 10 in.
2. Flask, for foundry
3. Strap, various sizes
COLLETS
1. For milling machine, selected sizes
2. For lathe, selected sizes
COMBINATION SQUARES — with hardened head and blade, and protractor head, 9 and 12 in.
COUNTERBORES — Straight and tapered shanks, selected sizes
COUNTERSINKS — for metal
CRUCIBLE TONGS — to fit crucibles
CRUCIBLES — selected sizes
1. Shanks, single end to fit ladles
2. Shanks, hand, to fit ladles
CUTTERS — angular milling, bevel gear, concave milling, convex milling, end milling, face milling, formed milling, grooving, involute gear teeth, key seat, side milling, and metal splitting
DIVIDERS — Spring, 4 and 6 in.
DRAW PINS — for molders
DRILLS
1. Drifts, different sizes
2. Sleeves, different sizes
3. Stand for Nos. 1 to 60
4. Stand for 1/16 to 1/2 in. by 64ths
DRILLS
1. Center
2. High speed, taper shank, various sizes
3. Jobbers, straight shank, 1/16 to 1/2 in. by 64ths
4. Ratchet
5. Straight shank, Nos. 1 to 60
6. Taper shank, 1/2 to 1 in. by 16ths
FILE CARDS
FILES
1. Die sinkers, various shapes
2. Flat bastard, 8, 10, 12, and 14 in.
3. Half round, double cut, 6, 8, 10, and 12 in.
4. Hand, smooth, 8, 10, and 12 in.
5. Mill, smooth, 8, 10, and 12 in.
6. Round bastard, 8 and 10 in.
7. Square bastard, 8 and 10 in.
8. Swiss, various shapes
9. Three-square, double cut, 6 in.
10. Warding, double cut, 6 in.
FIRST-AID CABINET AND SUPPLIES
FORGE TOOLS — drift pins, flatters, fullers, hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop
GATE STICKS — maple for foundry
GAUGES
1. Center
2. Depth
3. Drill and wire
4. Screw pitch, select kinds
5. Surface
6. Thickness
GLOVES — asbestos, for foundry
GOGGLES
1. For machine shop
2. For foundry
HACK SAW
1. Blades, hand, 18T, 10 in.
2. Blades, power, 14T, 12 in.
3. Frames, adjustable
HAMMERS
1. Babbitt
2. Ball peen, 13, 16, or 20 oz.
3. Blacksmith's, various kinds
4. Riveting, 9 and 12 oz.
5. Setting
INDICATOR
1. Center
2. Universal or universal dial test
3. Speed
KNURLING TOOL — with assorted knurls

(Continued on page 47A)

OLIVER machines give students the most thorough basic training

Used in the nation's leading vocational shops

Your Oliver-trained student has a decided advantage. His training on factory-proven machines is a sound basis for progress in industry.

The ability to endure rugged service year after year characterizes Oliver machines. They are designed and built for industry by engineers who also know the needs for thorough student training. Furthermore, Oliver safety features are the latest.

Students find Oliver machines easy to set up and operate. Self-locking devices keep the machines in perfect adjustment. In over 2345 vocational shops instructors agree that Oliver machines give more and better service for the dollar.

The machines shown here are but a few of a complete line to make your teaching efforts most effective.

OLIVER EQUIPMENT FOR VOCATIONAL SHOPS

Borers	Mortisers	Circular Saw Benches
Sanders	Surfacers	Straitline Cut-Off Saws
Shapers	Wood Trimmers	Metal Spinning Lathes
Tenoner	Band Saws	Woodturning Lathes
Jointers	Band Saw Brazer	Oilstone Tool Grinders
Jig Saw	Knives and Saws	Benches and Vises

Over 2345 vocational shops use Oliver equipment. Tell us the machines that interest you, and we'll send you bulletins containing full details.

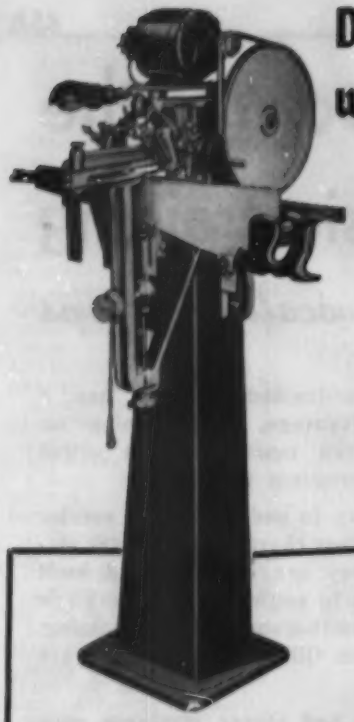
METAL SPINNING LATHE — *helpful and valuable in any shop!*

Spin beautiful, useful vases, cups, trays, etc., from copper, bronze, aluminum and other metals. The Oliver No. 159M Metal Spinning Lathe is precision built with extra heavy bearings for rugged service. Has ball bearing variable-speed motor-driven headstock and live tail center. Swings 12" diameter, 24" between centers. Can also be used for turning wood and light metals.

OLIVER

OLIVER MACHINERY CO.
GRAND RAPIDS 2, MICHIGAN

Double saw life—train your students better with FOLEY SAW FILING EQUIPMENT



EXCELLENT STUDENT TRAINING

Train your students to use Foley machines. They will do better work with Foley sharpened saws. Foley equipment is safe to operate and is widely used by hundreds of schools, colleges, industries, Army, Navy, Air Fore, etc.

FASTER SAW RECONDITIONING

You can sharpen 4 to 6 hand saws per hour with these three Foley Automatic power machines — Retoother, Saw Filer, Setter.

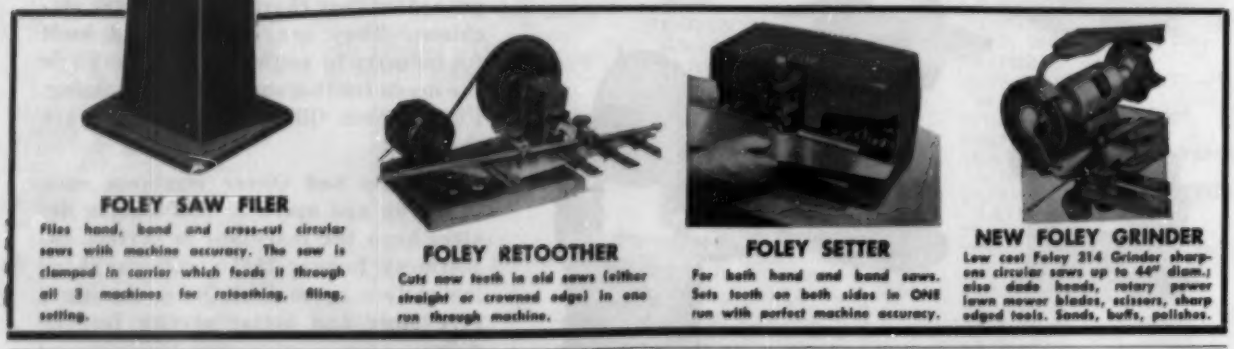
VOCATIONAL REHABILITATION

Foley Saw Sharpening Machines have proven their value for making physically handicapped persons self-supporting in their own business. Write us for full details.

30-DAY FREE TRIAL

Any Foley machine may be installed on 30 day FREE Trial. Write today for detailed information.

FOLEY MANUFACTURING CO.
3318 N.E. 5th St. Minneapolis 18, Minn.



FOLEY SAW FILER
Files hand, band and cross-cut circular saws with machine accuracy. The saw is clamped in carrier which feeds it through all 3 machines for retoothing, filing, setting.

FOLEY RETOOTHER
Cuts new teeth in old saws (either straight or crowned edge) in one run through machine.

FOLEY SETTER
For both hand and band saws. Sets teeth on both sides in ONE run with perfect machine accuracy.

NEW FOLEY GRINDER
Low cost Foley 214 Grinder sharpens circular saws up to 44" diam.; also disc heads, rotary power lawn mower blades, scissors, sharp edged tools. Sands, buffs, polishes.

DIXON'S

fine tools for Student Workers in the Art Metal Crafts

In the metal working arts money is saved by equipping with Dixon's high-grade, always dependable tools—the Standard for Quality among precious metal craftsmen during the past 50 years

You in all probability have our 184 page catalog of Dixon Tools for Art Metal Crafts. If not, write today, stating name of school and subjects taught.

WILLIAM DIXON, INCORPORATED
32–42 E. Kinney Street Newark 1, New Jersey

your best bench buy

SEND FOR NEW SHOP CATALOG

Cat. No. 64-50-412B

Join the parade of schools from Maine to California that have specified this Four-Student Woodworking Bench.

Bench size is 64" long, 50" deep, 33¾" high. Tough 2¼" laminated maple top has ⅝" thru bolts and 5" end bolsters for maximum strength and durability. Equipped with four woodworkers' vises and four exclusive combination bench stops and dogs! Steel base has 12 roomy project lockers (6 on each side), each 12" x 21" x 15". Doors are equipped with padlock attachments and spring hinges for automatic closing.

PARENT METAL PRODUCTS INC.
Locust at Fourth St. Dept. V-10 Philadelphia 6, Pa.

(Continued from page 44A)

LADLES
1. Bull
2. Hand bowls
3. Melting

LATHE DOGS — ½, ¾, 1, 1½, 2, 2½, and 3 in.

LEGGINGS — fireproofed duck, to protect students when pouring in foundry

LEVEL — 6-in. bench

LIFTING SCREWS — for molders

MALLETS — wood or soft

MANDRELS — selected sizes

MICROMETERS — inside, 1½ to 8 in.; outside, 0 to 1 in.; outside, 1 to 2 in.; outside, 2 to 3 in.

MOLDING BOARDS

MOLDING STICKS AND TROWELS — various kinds

NIPPERS — end cutting, 5 in.

OIL STORAGE TANK — with pump

OILSTONES — medium and fine

PAILS — galvanized, 12-qt. capacity for foundry

PARALLELS
1. Adjustable
2. Steel, assorted sizes

PLIERS
1. Combination, 6 in.
2. Side-cutting, 6 in.

PUNCHES
1. Center, ¼ and ⅜ in.
2. Hollow, ½, ¾, and 1 in.
3. Pin, ⅛, 5/32, 3/16, 7/32, and ¼ in.
4. Prick, ¼ in.

RAMMERS — for foundry
1. Hand
2. Floor

REAMERS — various sizes
1. Adjustable
2. Hand
3. Taper pin
4. With taper shank

RIDDLES — ¼ and ⅜-in. mesh, 18-in. diameter, for foundry

RIVET SETS — assorted sizes

SCALES
1. Steel, 6 in., graduated 1/64 to ⅛ in.
2. Steel, 12 in., graduated to 32nds

SCREW DRIVERS — 6 and 9 in. blade

SCRIBERS

SHOVELS
1. Coke
2. Sand

SNIPS — tin, 3 in. straight and 3 in. curved

SOCKETS — for taper shanks, drills and tools, selected sizes

SOLDERING COPPERS AND HANDLES — 1-lb. size

SPRAY CAN — for molders

SPRINKLING CANS — galvanized iron, 16-qt. capacity, for foundry

SPRUE PICKS — for molders

SQUARES
1. Machinist's, 6 in.
2. Blacksmith's

STEEL FIGURES — ⅛ in.

STEEL LETTERS — ⅛ in.

SWABS — for molders

TAPELINE — steel, 25 ft.

TAPS AND DIES
1. Machine screws
2. Pipe
3. N.F. ¼ to ¾ in.
4. N.C. ¼ to ¾ in.

TONGS
1. Blacksmith's, various kinds
2. Pick up, for foundry
3. Shake out, for foundry

TOOL HOLDERS
1. Boring tools
2. Cutting-off tools
3. Planer
4. R.H. and L.H. offset shank
5. Shaper
6. Slotter
7. Straight shank
8. Threading

TOOL HOLDER BITS — square, ¼, 5/16, ⅜, 7/16, and ½ in.

TRAMMEL POINTS

V BLOCKS AND CLAMPS

WHEEL DRESSER

WRENCHES
1. Adjustable, 8 and 10 in.
2. Pipe, 8 and 12 in.
3. Tape, adjustable, various sizes

Metalworking — Materials and Supplies

ABRASIVE CLOTH — aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls

ABRASIVE WHEELS

ACETYLENE GAS — in drums for welding

ALUMINUM
1. Pigs for foundry
2. Sheets, tubing, rounds, shapes, wire, etc.

BABBITT METAL

BEARING BLUE

BELT DRESSING

BELT LACING MATERIAL

BELT LEATHER

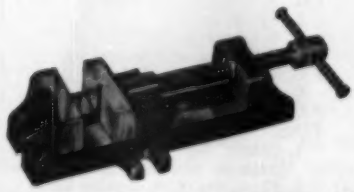
BOLTS
1. Carriage, selected sizes
2. Lag, selected sizes
3. Machine, selected sizes
4. N.F., selected sizes
5. Stove, flat or roundheads, selected sizes

BRASS
1. Bars, 3/32, ⅛, 5/16, and ¼ in. thick; ¾ to 1 in. wide, 8 to 10 ft. long, selected sizes
2. Round rods, 5/16 to ⅜ in. by 16ths, selected sizes
3. Sheets, 28 to 32 American gauge, 12 in. wide by 72 to 84 in. long, selected sizes
4. Strips, 1/32 and 1/16 in. thick, ½ to 1½ in. wide, 50 ft. to a coil, selected sizes
5. Threaded rods, Nos. 6 to

(Continued on page 48A)

machinists vise

woodworkers' vise


drill press vise

utility vise

choose these quality vises for every shop need

You can standardize on Desmond-Simplex vises for every department with the knowledge that any of the 44 vises in the line will stand hard use. Desmond-Simplex vises cost no more, yet provide outstanding advantages which set them apart from others.

In the machinists' line, the exclusive Desmond-Simplex steel slide is milled from solid bar stock, making it unbreakable . . . vise body is extra-heavy semi-steel . . . jaw inserts are replaceable . . . non-pinch handle is made in one piece.

Woodworkers' vises have full ⅞" diameter guide rods with reinforced tie bar for smooth, dependable operation. Jaw faces are accurately ground.

Three sizes of drill press vises available for all requirements. Utility vises have integral or removable pipe jaws. Send for a copy of our complete vise catalog and name of your nearest distributor. Standardize on quality on your next vise requisition.

Desmond-Simplex

THE COMPLETE LINE OF QUALITY VISES FOR SCHOOL SHOPS
DESMOND-STEPHAN MANUFACTURING CO., URBANA, OHIO

(Continued from page 47A)

10, in 24 in. lengths. Nos. 12, 14, ¼, and 5/16 in., in 24 in. lengths, selected sizes
6. Wire, soft, 8, 11, and 14 American gauge, selected sizes
7. Wire, spring, 8 to 22 American gauge, selected sizes

CASEHARDENING COMPOUNDS
CHAPLETS — single and double head
COAL
1. Charcoal for foundry or forge
2. Coke for foundry
3. Forge

COPPER
1. Pigs, for casting alloys
2. Sheets, 8 to 25 American gauge, 30 by 60 in., selected sizes
3. Tubing, outside diameters, 5/16, ¼, 5/16, ⅜, and ½ in.; thickness of wall, 1/32 in.; lengths, 8 to 12 ft., selected sizes
4. Wire, soft, 2 to 20 American gauge, in coils. Also in ¼, ½, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes

CORE
1. Compounds
2. Flour
3. Paste
4. Oil
5. Wax-vent wire

CUTTING COMPOUNDS
FIREBRICKS AND CLAY — for foundry
FIRE HANDLES — assorted sizes
GRAPHITE — for foundry
IRON — pig, for foundry
LACQUER — transparent and colored, for finishing
NUTS — S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds
OIL
1. Boiled linseed
2. Lubricating
3. Quenching and hardening

PACKING
Round, sheet, square, or tubular
PAINT — black asphaltum
PINS
1. Cotter, 3/32 to ¼-in. diam. from ½ to 2 in. long
2. Flask, for flask repairs
3. Taper, Nos. 0 to 6, ¾ to 2 in. long

PUMICE POWDER
RIVETS
1. Copper, with burrs, Nos. 7 to 14, lengths, ⅛ to ¾ in., selected sizes
2. Iron, No. 14 gauge to 5/16 in., flathead or button head, ¼ to 1 in. long, selected sizes
3. Tinners', flathead, 8 oz. to 16 lb., either tinned or black, selected sizes

SAND
1. Molding, in 350-lb. barrels or 800-lb. casks
2. Parting, in 350-lb. barrels or 800-lb. casks

SCREWS
1. F.H. or R.H. iron or brass, selected sizes and kinds
2. Cap and machine, iron or

(Continued on page 50A)

Lowest Prices for Top Quality!
SIMONDS SI-CLONE SAWS
You get Simonds Guaranteed Quality, the buy-word in saws for more than 100 years, at no more than you would pay for regular saws . . . see price list. And Simonds Si-Clone line includes 13 types up to 12" diameter. So get the Si-Clones you need today at your local hardware or woodworking machinery dealer.
GUARANTEE: Made of SIMONDS STEEL fully guaranteed against any defect in material or workmanship.
RETAIL SELLING PRICES
SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.
Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon

Teacher's pet . . .

HOSSFELD

UNIVERSAL® IRON BENDER

Wrenchless Type — Model #1

Bends Flat, Round, Bar, Angle, Pipe

Samples of Bar Bending

HUNDREDS of shop instructors in vocational training departments of schools and municipal, state and government institutions are sold on the merit and utility of the Hossfeld Bender. Their maintenance departments, too, recognize it as practical and indispensable in the shop as a bench vise, capable of replacing a half dozen special machines. Proved in thousands of factories and repair shops as well, the Hossfeld Bender will neatly, quickly and accurately teach your students the 101 different bending jobs that they will be called on to perform in repair, maintenance and production work. For a better bender — specify Hossfeld.

SPECIFICATIONS

#1 Bending Capacities
Standard Pipe & Conduit — up to 1½" I.D.
Heavy Bends, Direct on Center Pin; "U" Bends on Cam Dies, 3" x 7/16" Flat or ⅞" Round or Square Cold
Sharp Square Bends — 3" x ¼" Cold
Ornamental Iron Work — 2" x 3/16" Flat or ⅞" Round or Square, Cold
Eye Bolts — ½" Round or Square, Cold
Angle Iron — 1½" x 1½" x ¼", Cold
Automobile Spring Eyes — 3" x ½", Hot
90° Bends on Conduit, Heavy Wall, or Standard Pipe — 1" Cold

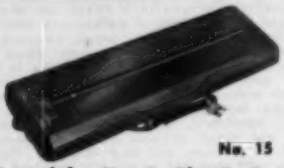
GET THE FACTS!
Write today for illustrated bulletin.

HOSSFELD MFG. CO.
438 W. 3rd Street Winona, Minnesota

SPECIFY Hotpack EQUIPMENT

AND GET THE EXTRAS IN SERVICE AND FEATURES

THE Hotpack ELECTRIC PLASTIHEETER



No. 15

Designed for Use in Plastic Courses in the School

The HOTPACK PLASTIHEETER is a commercial type strip heater designed to heat sheets of Plexiglas or Lucite until they become soft and pliable for shaping to the form desired. It is essentially used for straight line bends or folds and is capable of heating sheet material up to ½" thickness in from 30 seconds to 4 minutes depending on the thickness of the material. As the material does not come into contact with the heating element and the platen remains cool, there is no possibility of creating mark-off on the sheet.

SPECIFICATIONS

Model No.	Working Space	Overall Size
15	18"Lx5"Wx2½"H	21"Lx7"Wx3½"H
16	30"Lx5"Wx2½"H	33"Lx7"Wx3½"H

	Wattage 115 Volt	Shipping Weight	Price F.O.B. Phila.
15	200 W	4 lbs.	$22.50
16	350 W	6 lbs.	35.00

Hotpack ELECTRIC CERAMIC KILNS

1. Eye level controls – pilot light. 2. Built-in pyrometer for visible accurate temperature indication. 3. Handles are cool to touch. 4. Central switch – low, medium, and high heat for even distribution. 5. Special insulation holds heat and prevents scorching of table top. 6. Maximum temperature 2050° F.

SPECIFICATIONS

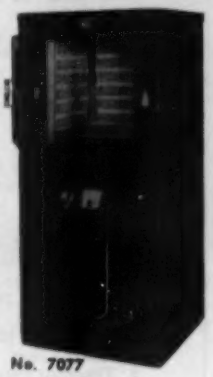
Model No.	Interior Size	Shelves Furnished	Approx. Time	Price F.O.B. Phila.
7006	8" 8"x 5½"	1	3 hrs.	$85.00
7004	8" 8"x11"	2	4 hrs.	115.00
7005	12"12"x11"	2	3 hrs.	250.00
7007	15"x15"x16½"	3	4 hrs.	460.00
7009	12"x12"x 5½"	1	4 hrs.	135.00

Enameling on copper can be efficiently fired on our models Nos. 7006 and 7009.

Hotpack ELECTRIC HEAT TREATING FURNACE

For Hardening, drawing, tempering and annealing or normalizing of dies, punches, gages, fixtures or other parts are performed readily with these redesigned Hotpack Electric Box Furnaces.

This new Hotpack Electric Furnace is fast heat-built for continuous use from 300° F. to 2000° F. It is the only Furnace equipped with Automatic Controlling-Indicating Pyrometer and also with Limistat control in this price field.

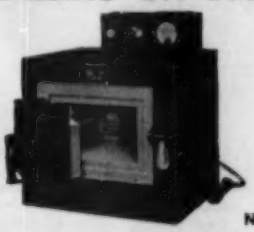


No. 7077

SPECIFICATIONS

Model	Interior Size W. D. H.	Current Characteristics	Prices F.O.B. Phila.
7076	8"x 8"x 5½"	110 V AC 15 Amp.	$265.00
7074	8"x 8"x11"	115 V AC 15 Amp.	295.00
7075	12"x12"x11"	220 V AC 23 Amp.	430.00
7077	15"x15"x16½"	200 V AC 30 Amp.	640.00
7079	12"x12"x 5½"	110 V AC 15 Amp.	305.00

Hotpack CONTROLLED TEMPERATURE KILN FOR ENAMELING ON COPPER



No. 7066

These units provide manual adjustment of temperature for kilns. They may be regulated so that current may be supplied to the kiln for any percentage of time per minute. This method of selection provides exact temperatures because the slightest movement of the control knob will vary the time of input, thereby raising or lowering the temperature as desired.

Model	Interior Size	Price F.O.B. Phila.
7069	12"x12"x5½"	$170.00
7066	8"x 8"x5½"	130.00

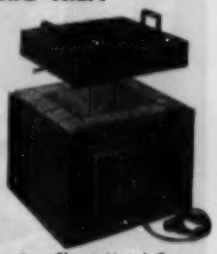
SEND FOR COMPLETE DETAILS AND NEW CATALOG

Hotpack KILN KIT

EVERYTHING YOU NEED TO MAKE THIS PROFESSIONAL LOOKING ELECTRIC KILN

LARGE CHAMBER:

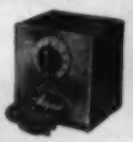
12" deep, 11" wide, 9" high



YOU GET: Illustrated instruction Manual, Insulating Back Up Material, Insulated Cover and Handle, Wire – Screws – Terminal Board, Insulating Brick – cut to size, Sheet Metal Case – welded and painted, Hotpack Heating Elements, wired, 15 amps – 115 volts – Ready to install.

Prices Including Freight and Crating:
East of Denver – $52.00
West of Denver – 60.00

YOU NEVER FORGET to turn off your kiln with the



HOTPACK LIMITOR

Plug-in Type, 115 v. $14.95
Wire-in Type, 220 v. $27.95

Hotpack PLASTIC PRE-HEATING EQUIPMENT

ELECTRIC PORTABLE OVEN

For preheating Methyl Methacrylate in sheet or rod form where it is necessary to maintain oven temperature throughout the sheet, especially desirable in compressed air, vacuum or pressure forming techniques.

The Oven is controlled by a newly developed thermostatic control, sealed in and conveniently placed on the front panel, of the Oven. It can accurately be set at any desired temperature where a quick rate of heat up to 306° F. is desired.

No. 600

Due to the Aluminum Construction, the Oven is very light in weight and can be carried from room or project to project. As it operates on 110 volt AC or DC, it can be plugged into any 110 volt receptacle.

SPECIFICATIONS

Model	Interior Size	Wattage 110 AC-DC	F.O.B. Phila.
600	12"Wx12"Dx12"H	700	$ 90.00
602	24"Wx12"Dx12"H	1400	145.00

THE ELECTRIC Hotpack COMPANY, INC.

5067 COTTMAN AVENUE • PHILADELPHIA 35, PA.

Help Your Student

"DO HIMSELF PROUD"

Order MGC *Quality* CRAFTMETALS

MGC

means a better start towards a superior result!

When Metal Goods Corporation's *Super - Brite MIRROR - Finish Aluminum*, and other specially-prepared craftmetals are supplied, your students are given their best chances of noteworthy achievement. But don't take our word for it—investigate the possibilities of these fine craftmetals in connection with your teaching. Mail the coupon for a free copy of our instruction booklet and metal price list. We think you'll be pleasantly surprised to learn how inexpensive it is to give every student the benefit of the best in his metalcraft projects.

SAFE-T-ETCH

NON-ACID ETCHING COMPOUND

a boon to the craft instructor

Especially suited to class work, because it eliminates the hazards and objectionable features of acids, our new non-acid etching compound, SAFE-T-ETCH, is a safer . . . faster . . . easier way of etching aluminum. Regardless of the particular phase of metal-crafting in which you are interested, MGC can supply the proper blanks and shapes — ready for crafting in aluminum, brass, copper and stainless steel. Mail the coupon now and get full information. No obligation, of course.

Send Coupon for *Free* INSTRUCTION BOOKLET, METAL PRICE LIST

METAL GOODS CORPORATION

Craft Division
METAL GOODS CORPORATION
5247 Brown Ave., St. Louis 15, Mo.

(Please type or print)

NAME_____

ADDRESS_____

CITY_____ ZONE ____ STATE_____

(Continued from page 48A)

brass, selected sizes and kinds
3. Set, head and headless

SOLDER — acid or rosin core; bar, or solid wire

SOLDERING PASTE OR SALTS

STEEL
1. Bessemer, rod, 1/64 to 3/8 in. by 64ths, in 4-ft. lengths, selected sizes
2. Bars, cold rolled, 1/8 to 3/8 in. thick, 1/2 to 2 in. wide, 12-ft. lengths, selected sizes
3. Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3-ft. lengths, selected sizes
4. Rods, hexagon and square, cold rolled, 1/4 to 3/4 in., in 12-ft. lengths, selected sizes
5. Round, cold rolled, diameters 1/8 to 1 in., lengths 12 ft., selected sizes
6. Sheet, black, Nos. 18, 20, 22, 24, 26, 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in.
7. Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in., selected sizes
8. Threaded rods, Nos. 6 to 10, in 12-in. lengths, Nos. 12, 14, 1/4 in., and 5/16 in., in 24-in. lengths, selected sizes

TIN
1. Pigs, for casting alloys
2. 1C, 1X, 20 by 48 in.
3. 1XX, 20 by 48 in.

WASHERS AND BURRS
1. Copper burrs, Nos. 3 to 14, in 1-lb. boxes
2. Iron burrs, Nos. 3 to 14, in 1-lb. boxes
3. Brass washers, 3/16 to 1/2 in. by 16ths
4. Iron washers, 3/16 to 1/2 in. by 16ths

WELDING FLUXES

WELDING RODS (all rods come in 24-in. lengths)
1. Brazing, 1/16, 1/8, and 3/16-in. diameter
2. Cast aluminum, 3/16, 1/4, and 1/8-in. diameter
3. Cast brass, 3/16, and 1/8-in. diameter
4. Cast bronze, 1/4-in. diameter
5. Cast copper, 3/16 and 1/4-in. diameter
6. Cast iron, 3/16, 1/4, 5/16, and 1/8-in. diameter
7. Low carbon steel, 1/8, 3/16, and 1/4-in. diameter

WHITE LEAD — for machine shop

WIRE
1. Annealed, 16 to 34 W and M gauge, selected sizes
2. Coppered market, 5 to 18 W and M gauge, selected sizes
3. Coppered spring, 2 to 18 W and M gauge, selected sizes
4. Galvanized, 5 to 18 W and M gauge, selected sizes
5. Piano, Nos. 2/0 to 36, selected sizes
6. Tinned, 16 to 24 W and M gauge, selected sizes
7. Wool, Nos. 0 to 3 in 1-lb. packages, selected sizes

ZINC
1. Pigs, for casting alloys
2. Sheet, Nos. 4 to 14, sheets 36 by 84 in.

WHAT'S NEW IN PLASTICS FOR THE SCHOOL SHOP

Plastic Parts & Sales now brings you a variety of amazing new plastic materials that mean a real opportunity for shop teachers to make tremendous advances in their plastic craft programs. The outstanding properties of these plastics have been proved in many different types of industrial applications. The possibilities which they offer you and your students to profit from new ideas . . . new projects . . . new processes are unlimited.

VINYLAIRE Plastic Foam

In character, Vinylaire is a closed cell structure composed of a multitude of uniform size individual cells. It is free from voids, seams, contaminants, and any ingredients that accelerate aging and deterioration. Non toxic. It is impervious to body acids, oils and various chemicals, chlorinated and salt water. It is water repellant — has better buoyancy than cork or kapok. It can be heat sealed, fabricated, cemented to wood, leather, fabric and metal; stitched, riveted; die cut and sawed. It is flame and cold resistant. Can be washed with soap and water, cold sterilized. 28% lighter than rubber, it is shock resistant, and will not "bottom." Commercial uses include life preservers, protective padding for athletic equipment, orthopedic braces, etc. 36" x 44" sheets; 1/4" through 2" thick. White, only.

MYLAR Polyester Film

0.001" and thicker. It is the strongest of all plastic film. Retains its properties and flexibility over a temperature range of from minus 80 deg. to 300 deg. F. Is unaffected by oils, grease, most acids and alkalis. Resists moisture and solvents. Has exceptional dielectric strength. Ideal for insulation for motor stator, generator, and solenoid coils, capacitor; crackproof kites. When laminated and embossed, it provides a variety of new materials for decorative panelling, window shades, belts, etc.

White Polyethylene Rope

It floats! Produced by the twisted-spun-laid method. It's attractive, long lasting, lightweight, dimensionally stable. Completely waterproof and buoyant. 30% lighter than natural fibre rope. Has extremely high resistance to virtually all types of acids and solvents, salt water, alcohol. It is unaffected by mold, bacteria, rot, fungi. Has excellent weathering characteristics. Does not deteriorate with age. Available in 3/16" to 3/4" dia. Ideal for water ski tow lines, swimming pool marking lanes, heaving lines and other life-saving equipment, functional and decorative applications.

FIBERGLAS-POLYESTER AND EPOXY RESINS

Build Sports Car Bodies, Boats, Work Bench Tops, Awnings, Furniture, etc.

Send for FREE literature giving complete buying information on everything you need in Fiberglas-Plastic for the school shop. It describes in detail Glass Cloth, Resins, Extenders, Catalysts, Solvents, "How-To" Books, etc. Also includes sample of this remarkable material for your inspection. Write today! . . . and plan to get everything you need for the above and other high interest projects from Plastic Parts & Sales.

SPECIAL OFFER! **BEGINNER'S KIT**

Our "COVER-IT KIT" contains the right amount of material for the beginner student, or to experiment with yourself. Let's you see how easy it is to repair boats, toys, lamps, furniture, etc. Complete Kit.....$3.95 (plus 50¢ postage.)

Send for Our Price List

America's Most Complete and Up-to-Date Line of Plastics!

It gives useful buying data on Plexiglas, Acetate, Castolite, Molding Powders and Presses, Cold Setting and Hot Melt Casting Resins, Finishing Compounds, and others. Don't delay — write today!

PLASTIC PARTS & SALES

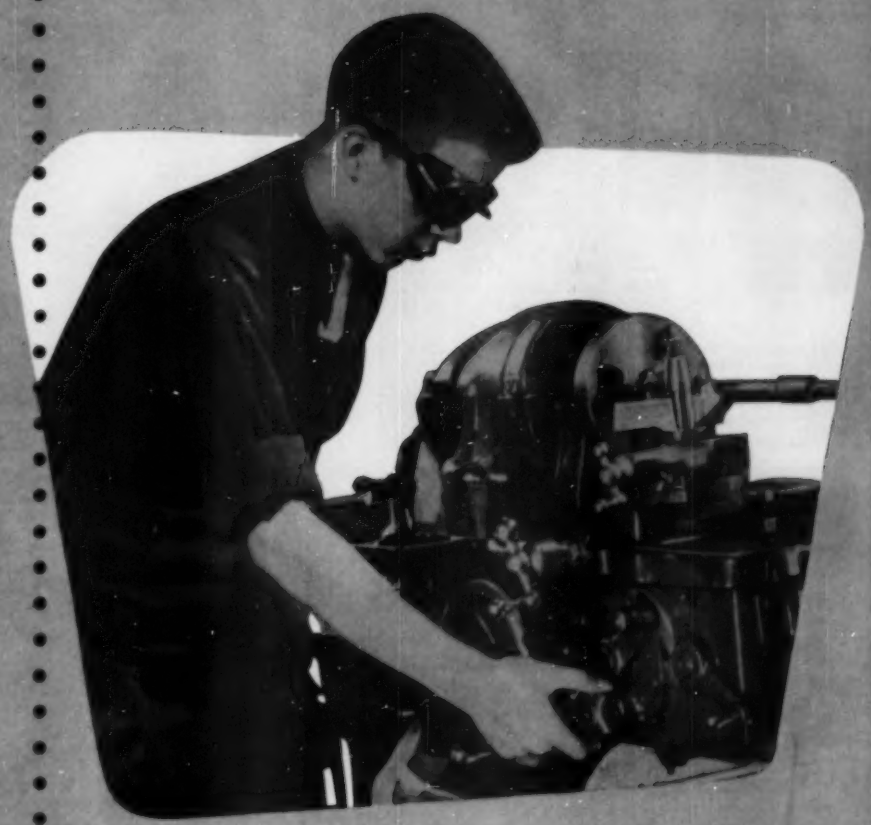
1157 S. Kingshighway Blvd., St. Louis 10, Mo.

PREPARE . . . your students for each new project

VISUALIZE . . . the problems they will encounter

DEMONSTRATE . . . how these problems can be solved

EMPHASIZE . . . the correct procedures to be used



SHOP SAFETY
WOODWORKING
BENCH WORK
WELDING
MACHINING
ENGINE LATHE
AUTOMOTIVE MECHANICS
TECHNICAL LETTERING
AIRCRAFT MECHANICS
SHOP DRAWING
MECHANICAL TRAINING

Jam Handy Class-Tested
filmstrips and motion pictures
for *Shop Training*

Write for **FREE** *Illustrated catalog*
The **JAM HANDY** *Organization*
2821 East Grand Boulevard • Detroit 11, Michigan

To teach electronics better—at lower cost

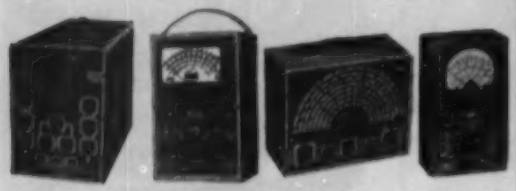
MORE SCHOOLS USE EICO KITS & INSTRUMENTS

Here's Why . . .

EICO KITS are top-quality professional TV/radio/electronic test instruments—embody latest performance-proven design and circuitry. Complete with all components, pre-punched chassis, deep-etched aluminum panel, rugged steel case. "Beginner-Tested" step-by-step instructions help the student learn by "doing it himself"—quickening his familiarity with the construction, operation and maintenance of electronic instruments.

EXCLUSIVE VISUAL TRAINING AID!
Vacuum Tube Voltmeter DYNAMIC DEMONSTRATOR only $10.00

Simulates EICO #221 VTVM in all its functions and ranges. Helps you teach the use and reading of the VTVM with giant 13" meter scale. 14½" wide x 23" high x 3½" deep. Easily viewed from desk or wall by complete class. Punched holes for easy hanging. Steel cabinet, aluminum panel.



425K 5" Push-Pull Oscilloscope	221K Vacuum Tube Voltmeter	320K RF Signal Generator	536K 1000 Ohms/Volt Multimeter
KIT $44.95. Wired $79.95.	KIT $29.95. Wired $39.95.	KIT $19.95. Wired $29.95.	KIT $12.90. Wired $14.90.

Prices 5% higher on West Coast.

FREE Catalog VE-3 describes EICO's 36 KITS and 42 wired instruments—the industry's most complete line. Write for it now.

EICO

ELECTRONIC INSTRUMENT CO., Inc.
84 Withers Street • Brooklyn 11, N. Y.

© 54

KESTER

Preferred in classrooms from coast to coast because it's the same fine solder they'll be using when they graduate!

Write for free Kester Solder booklets...both Instructor and Student editions.

KESTER SOLDER COMPANY
4207 Wrightwood Avenue • Chicago 39, Illinois
Newark 5, New Jersey • Brantford, Canada

SOLDER

AUTOMOTIVE EQUIPMENT

(Continued from page 42A)

CALIPERS
1. 6" — inside spring nut release, screw thread adjustment. High grade spring steel
2. 6" — O.D. spring nut release, screw thread adjustment. High grade spring steel

CARBURETOR TOOL KIT
Complete set of overhaul tools for popular makes of carburetors

CHISELS
1. Cape ¼" — 6" length forged tool steel
2. Cold ½" — 6" length forged tool steel
3. Diamond point ¼" — 6" length forged tool steel

DIES (for economy, purchase taps and dies in sets)
1. Machine screw — 6-32NC, 6-40 NF, 8-32NC, 8-36NF, 10-24NC, 10-32NF, 12-24NC, 12-28NF
2. National standard — adjustable round split dies forming American standard thread 7/16" thickness, 1 5/16" outside dia. high quality alloy: ¼"-20NC, 5/16"-18NC, ⅜"-16NC, 7/16"-14NC, ½"-13NC, 9/16"-12NC, ⅝"-11NC, ¾"-10NC, ⅞"-28NF, 5/16"-24NF, ⅜"-24NF, 7/16"-20NF, ½"-20NF, 9/16"-18NF, ⅝"-18NF, ¾"-16NF
3. Die stock machine screw — to hold 1 5/16" O.D. round adjustable machine screw die
4. Die stock, national standard — to hold 7/16" thick, 1 5/16" O.D. national standard die

DIVIDERS
6" stiff spring tapered spool, high quality spring steel legs with replaceable needle-points

DRILL STAND — fractional 1/16" to ½"

DRILL, ELECTRIC (*see* Special Equipment Section)

FILE CARD
Steel back frame and face. Tempered steel wire bristles, complete with steel tapered pick

FLARING TOOL
3/16" to ⅜" O.D. tubing size

GAUGES
1. Shoe and drum gauge — leaf type shim gauge for testing brake shoe and drum clearances
2. Tire gauge, standard tire pressure gauge, 0-60 lb. capacity
3. Screw pitch gauge, 60°V type thread, 22 pitches, 32 to 74
4. Thickness gauge, 2 9/16" length blade, 22 blades .004" to .025" tempered and encased
5. Thickness gauge, 6" blade, 8 tapered leaves, .002, .003, .004, .006, .008, .010, .012, and .015 leaves

HAMMERS
1. Machinist — 12 oz. ball peen, forged steel, heat treated and polished, wooden handle
2. Machinist — 24 oz. ball peen, forged steel, heat treated, wooden handle
3. Claw hammer, adze eye, curved claw, bell shaped head. Wooden handle, forged head
4. Sledge — 7 lb. bell face, adze eye, forged hardened and tempered steel. Wooden handle
5. Soft faced head, wooden handle

KNIFE, PUTTY
1¼" wide 3½" long, tempered polished elastic steel

MICROMETERS
1. Inside diameter — calibrated to .001", range 2"-9½", calibrated thimble with ground steel extension rods. Angular

grooved extensions for quick adjustment
2. Outside diameter — drop forged "I" section frame. Anvil, spindle, and barrel high quality, ground steel. Standard calibrations. Size 0–1", 1–2", 2–3", 3–4". (4 sizes)

OILER
5 oz., 3" spout, steel can, tempered steel bottom

OIL STONE
4" x 1¼" x ½" medium, complete in wooden case

OIL MEASURE
2 qt. heavy gauge galvanized steel combination measure, funnel and spout. All seams soldered

PISTON RING INSERTER SET
Spring steel strap type with a "T" handle adjusting device

PLIERS
1. 5" — flat nose, cross-checked, spring tempered nose, forged tool steel
2. 7" — long tapered flat nose, cap joint forged, tempered crestalog steel or equal
3. 8" — combination slip joint, forged tool steel
4. 7" — diagonal cutter mechanic's pliers, forged heat treated high grade tool steel

PUNCHES
1. Drive pin, 8" knurled hardened steel, set of 8: 3/16" dia. to 5/16" dia.
2. Center, ¼" x 4", forged alloy steel hammer tested, knurled handle

RIVET SET
Hand type for button head rivets

RULE, STEEL
12" x 1" width stainless steel, tempered, graduated in ⅛", 1/16", 1/32", 1/64"

SAW, HAND HACK
8" — 12" adjustable frame, 2¾" throat, pistol grip

SCREW DRIVERS
1. 3" — carbon steel blade, wooden handle pinned to blade
2. 6" — carbon steel blade, 5/16" dia. wooden handle pinned to blade
3. 9½" — square drop forged steel blade, perfect handle grip riveted to blade
4. 6" — carbon steel blade, 3/16" dia. tough plastic molded handle
5. Offset at both ends, forged and tempered tool steel, set of 6 for 3/16" to ¼"
6. Phillips head screw driver, alloy steel tempered deep fluted blade. Set of 4 to fit points No. 1, 2, 3, and 4
7. Clutch head screw driver, alloy steel tempered. Set of 4, No. 1, 2, 3, and 4

SCREW EXTRACTOR
Straight shank, deep fluted blade, hardened tool steel, set of six

SCRIBER
⅛" dia. 10" double point hardened tool steel

SNIPS, TIN
1. Straight — 3" drop-forged hardened tool steel, straight blade ground and polished
2. Curved — 3" drop-forged, hardened tool steel

SOLDERING IRON, ELECTRIC
⅝" electric soldering copper, 200 watt complete with cord, tip and stand

SQUARE, COMBINATION
Tempered 12" blade with forged square, center, protractor heads

STAMPS, STEEL
1. 5/16" hand cut figures 1 to 0.
2. 3/16" hand cut letters A to Z

TAPS (for economy purchase taps and dies in sets)
1. Machine screw taps — hand tap, plug

(Continued on page 56A)

Fibre-glass makes this new welder

SHOCKPROOF! NOISELESS!

IDEAL FOR CLASSROOMS... SAFE—SILENT

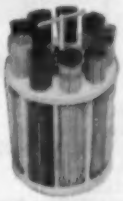
Marquette's new 90 Series Welder is best for classrooms because it is shockproof, noiseless and makes arc striking easier. Why? The welder is enclosed in tough, durable fibre-glass which is *non-conductive!* The "Perma-Shield" cabinet eliminates eddy current losses, noisy vibrations and shock-danger. This new welder is ten per cent more efficient and provides improved arc striking characteristics... advantages that teachers and students alike will welcome.

That's not all! The fibre-glass cabinet is rustproof, colorproof, waterproof and moisture proof. It's stronger than steel but lighter in weight and practically indestructible. The entire welder is best for training purposes because it's easier to operate (heat taps are clearly marked and safe, positive and easy to select), it's built to last longer and it will always keep its new appearance.

Two sizes in four models are available. One delivers a maximum of 200 amperes; the other, 275 amperes and each is available capacitor equipped, for increased power factor.

WHAT DOES ANODIZED ALUMINUM MEAN TO WELDING TORCHES?

It's new and Marquette's got it! Oxy-acetylene welding torches made of *anodized aluminum* make them 50 per cent stronger and 50 per cent lighter. Precision made, they're practically unbreakable and will stand years of rough handling. Makes them perfect for training schools. Eliminates factory service because they're equipped with fast change O-ring seals. Simply replace worn seals with new ones and the torch is ready for action in minutes time. Three models (Aero-Jet, Star-Jet and Super-Jet) are available for welding and cutting all thicknesses of metal.



WHAT KIND OF ROD DO YOU WANT?

Marquette makes a welding electrode or gas rod for every welding application. From its famous No. 130 Red Rod for getting deep penetration in dirty, rusty metal to its No. 15 Presto-Arc rod for high speed welding of sheet metal, Marquette offers the best for any shop. This range of rods includes high tensile, hard surfacing, cast iron, special alloys and bronze rods.

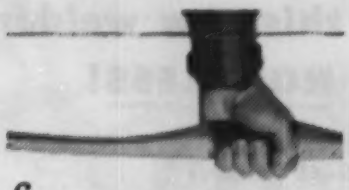
WRITE FOR THESE FREE FACT-PACKED BULLETINS

1 The 90 Series Arc Welder
2 Jet Series Welding Torches
3 "Guide to Better Welding"

When it Comes to Welding Come to

MARQUETTE
WELDING EQUIPMENT

Marquette Manufacturing Company, Inc., 307 East Hennepin Avenue
Minneapolis 14, Minnesota



for greater accuracy

VENUS... the drawing pencil preferred by professionals

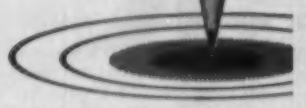
sharper, cleaner lines ... because the lead is homogenized by the exclusive Venus Colloidal Process.* The result: a lead that's uniformly smooth from top to bottom to give perfect drawings or tracings—no smudging, easily erased.

holds point longer ... because Pressure-Proofing* seals lead to the wood along the pencil's entire length. That's why Venus drawing pencils are stronger ... hold a needle point longer.

accurately graded ... thanks to grading by hand. That's why Venus, in all 17 degrees of hardness, gives engineers the consistent grading they need.

Ask for Venus drawing pencils at your favorite store.

*Exclusive Venus patent



VENUS drawing pencils

with the green crackled finish

Send for helpful, illustrated instruction brochure "Sketching with Venus Pencils," only 25c and get a FREE Venus Drawing Pencil.

American Pencil Co. Dept. IA-3-56
Hoboken, N. J.

Enclosed is 25c for "Sketching with Venus"—and my free Venus Drawing Pencil. Degree I want is ( ).

Name.....

Address.....

City..... State.....

Drafting – Small Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies, may be used by the students in the industrial arts and vocational education courses

ADJUSTABLE-CURVE RULER
BEAM COMPASS
BENCH BRUSHES
BLUEPRINT
1. Frame or machine
2. Washing trays or washer
3. Paper tube, airtight
4. Drying rack or dryer
BOOKCASE
CABINET
1. For filing drawings
2. For storing drawing boards
3. For storing drawing instruments
4. For storing models
CALIPERS — 6 and 8 in., inside and outside
CHAIR — teacher's
CHALKBOARD
1. Permanent or portable
2. Compass, 15 in., with locking device
3. Drawing set, T-square, Straightedge, triangle, and protractor
DESK — teacher's
DIVIDERS — proportional
DRAFTING MACHINE — and accessories
DRAFTSMAN'S STEEL PROTRACTOR
DRAWING BOARDS — large
DRAWING-BOARD SUPPORTS — to be set on or attached to woodworker's bench
DRAWING TABLES AND STOOLS
1. For students
2. For teachers
INK-BOTTLE HOLDER
IRREGULAR CURVES — Nos. 17, 21, and 24, wood, or transparent
LETTERING ANGLES
LETTERING PENS — assortment of 12
LEVEL OR TRANSIT — builders' for architectural students
LEVELING ROD — for use with the transit
MACHINISTS' COMBINATION SET — 12 in.
MARKING PINS — for use with measuring tape, for architectural students
MICROMETER — 1 in., for mechanical-drafting students
OILSTONE — 3-in. case
PANTOGRAPH — 21 in.
PARALLEL RULES
PLANIMETER
PLUMB BOB
SHEARS — for trimming blueprints and drawings
SPEED COUNTER — for mechanical-drafting students
STEEL SCALES — 12 in.
STOP WATCH — for mechanical-drafting students
TABLE
1. For cutting and trimming drawings and blueprints
2. For disassembling and reassembling machine parts and models
TAPELINE
1. 100 ft., steel, for architectural students
2. 50 ft., steel or metallic
TOOLBOX — containing 1 machinists' hammer, one 6-in. adjustable wrench, one 6-in. screw driver, one 6-in. combination pliers
TRIANGLES
1. 30–60 deg., 14 in. transparent
2. 45 deg., 10 in. transparent
TRIANGULAR SCALES — civil engineers' type, 12 in.
T SQUARE — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing board
WALL CHARTS — lettering, decimal equivalents, etc.
YARDSTICK
To be provided by, or for, each student

Drafting Supplies

DRAWING BOARD — size to be specified by instructor
DRAWING INSTRUMENTS — as specified by instructor
ERASING SHIELD
IRREGULAR CURVE — Nos. 8 and 13, transparent
PENCIL COMPASS
PENHOLDER — for lettering pens
PENS — assorted, for lettering
PROTRACTOR — not over 5 in.
SCALE — 12 in. architect's, triangular
SCALE GUARD
SLIDE RULE — as specified by instructor
T SQUARE — to fit drawing board
TRIANGLES — 30–60 deg., 10 in. transparent, and 45 deg., 8 in. transparent

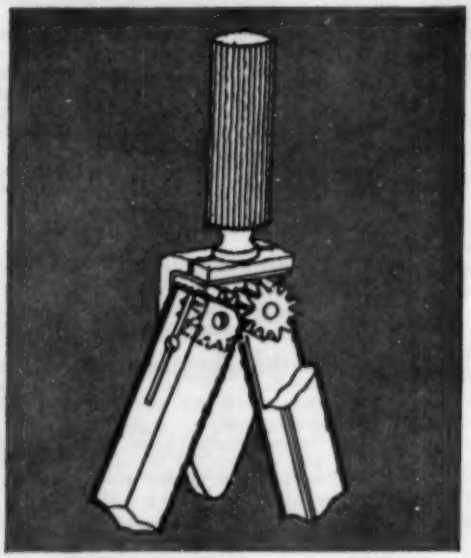
Drafting Equipment

BICHROMATE OF POTASH — crystals
BLUEPRINT
1. Paper, 36 in. wide
2. Writing fluid
PAPER
1. Cross section, 8½ by 11 in.
2. Detail, 24 by 36 in.
3. Drawing, 24 by 36 in.
4. Isometric, 7 by 10 in.
5. Tracing, 36 in.
POWDER — for tracing cloth
TRACING CLOTH — 36 in.
VAN DYKE
1. Fixing salts
2. Paper, 36 in.
3. Writing fluid

(Continued on page 56A)

This head construction doubles the life of drawing instruments

New gear head straightening device provides smoother action, replaces on the spot



Cutaway view of Post's exclusive gear head straightening device. By simply removing a screw in the head, gears can be replaced.

In selecting student instruments, you look for proper weight and balance, good tension and rugged materials. These are the obvious things, but quality consists of *hidden* features, too.

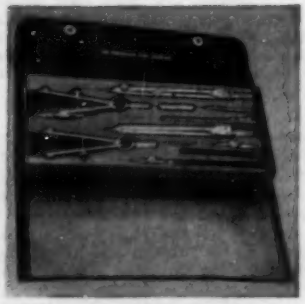
Post meets these requirements, then goes a step further. Inside the head of Post compasses and dividers is a straightening device made of two steel gears, fitted to exact precision. These gears permit easy manipulation while maintaining the head exactly perpendicular to the working surface.

Many brands of drawing instruments have no straightening device at all. Those brands that do have similar gear-type construction build it into the instrument *permanently*. This means that when the gears show wear, the leg or entire instrument must be replaced.

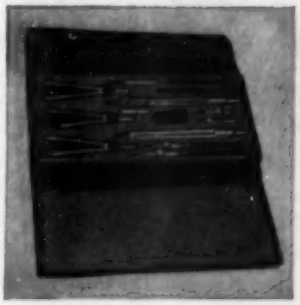
With these Post instruments, however, worn gears are easily replaced on the spot by simply removing a screw in the head. No special tools are needed. This exclusive Post feature saves money by doubling the life of the average instrument.

Compare Post quality dollar for dollar. Order sample instrument sets on 90 day approval. Write the Educational Division, Frederick Post Company, 3657 N. Avondale Avenue, Chicago, 18.

POST



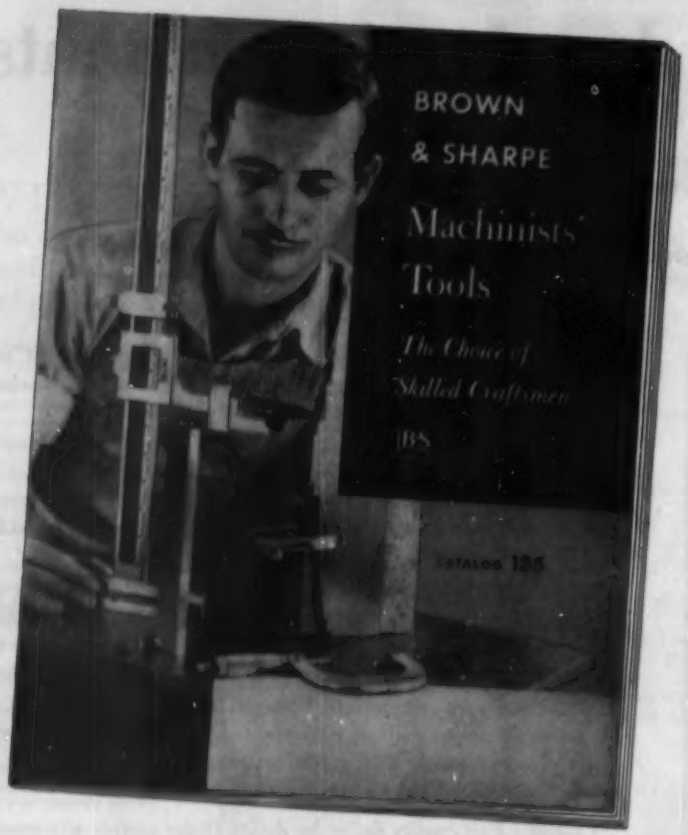
1144 – "Techmaster" Set
Contains: 4½" ruling pen; 4" side adjustment circular spring bow divider; 4" side adjustment circular spring bow combination pen and pencil; 5½" divider with gear-type straightening device; 5½" compass with gear-type straightening device, lengthening bar and interchangeable pen, pencil and divider parts. Each set includes an extra ruling pen handle, adjusting key and lead box. School price $5.33.



1130C – "Draftmaster" Set
Contains: one 4½" and one 5½" ruling pen; 4" center adjustment, circular spring bow divider, bow pencil and bow pen; 6" divider with straightening device and removable points; 6" compass with lengthening bar and interchangeable pen, pencil and divider parts. Each set includes extra ruling pen handle, lead box, and a well stocked kit of replacement parts. School price $10.35.

New!

Student-Aid Catalog Shows Precision Tools "In Action"!



Here's a catalog that will help students to handle precision tools more efficiently! Besides illustrating the *complete* line of Brown & Sharpe Machinists' Tools, its 48 pages contain basic information and instructive photos showing tools in use.

Profusely illustrated sections on micrometers, rules, combination squares, gages, and other precision tools, clearly show how advanced design features insure high, positive precision . . . how correct use "transfers" this precision into fine workmanship.

Make sure each of *your* students has a copy. Mail coupon.

Brown & Sharpe B&S

BROWN & SHARPE MFG. CO., Providence 1, R. I., U.S.A.

Please send me (_____) copies of Catalog 135.

NAME _____ TITLE _____

SCHOOL _____

ADDRESS _____ CITY _____

Drafting — Additional Supplies

(Continued from page 54A)

To be provided by, or for, each student

ERASERS
1. Cleaning
2. Ink
3. Pencil

INK
1. Black, waterproof
2. Colored, if required

PENCILS — DRAWING, HB, 2H, 3H, 4H, and 6H

PENCIL POINTER PAD

THUMBTACKS OR SCOTCH TAPE

AUTOMOTIVE EQUIPMENT

(Continued from page 53A)

type, straight fluted, high quality, carbon steel fine ground thread; 1-set: 6–32NC, 6–40NF, 8–32NC, 8–36NF, 10–24NC, 10–32NF, 12–24NC, 12–28NF

2. N.C. Standard — hand tap plug type, national course standard thread, high quality carbon heat treated steel, 1-set: ¼"–20, 5/16"–18, 3/8"–16, 7/16"–14, ½"–13, 9/16"–12
3. National fine standard, hand tap, plug type high quality carbon heat treated steel, 1-set: ¼"–28, 5/16"–24, 3/8"–24, 7/16"–20, ½"–20, 9/16"–18, 5/8"–18, ¾"–16
4. National Standard Pipe, 1/8", ¼", 3/8"

TAP WRENCH
1. T-handle, single handle, adjustable chuck, hardened jaws, made of quality steel
2. Machine screw tap wrench, T-handle adjustable vise jaw, for holding machine screw tap size 6–32 to 12–28, quality steel
3. National Standard tap wrench, adjustable vise jaw, for holding tap sizes ¼" to ¾", high quality steel

WRENCH, ADJUSTABLE
6" — single and adjustable jaw, forged steel, replaceable parts

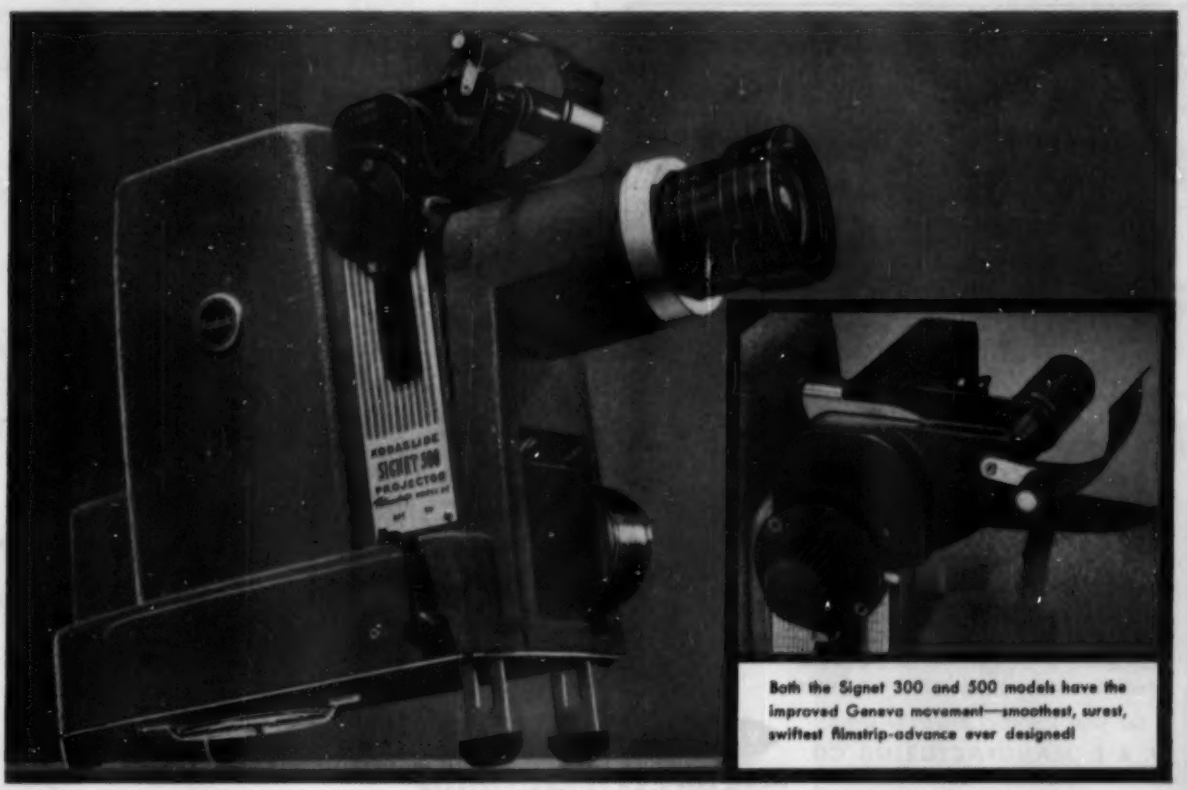
WRENCH, MONKEY
10" length, 2" capacity, forged jaws and handle with nonmetallic fitted handle

WRENCH, PIPE
10" — length, 1/8" to 1" pipe capacity, forged and hardened tool steel

WRENCH, SPANNER
Adjustable hook drop forged carbon steel hardened and finished smooth. Set of 3, capacity 3/8" to 4¼" diameter
It is recommended that only high quality alloy steel wrenches and sockets be purchased. Specifically, they should have lifetime guarantees so that cracked sockets and sprung wrenches can be replaced free of charge

WRENCHES, BOX
Double broached hex, double offset drop forged chrome-moly alloy steel. Lifetime guarantee and replaceable. 4 to 8 sets: 4½" to 6" (short length), 5/16" and ½", ¼" and 5/16", 5/16" and 3/8", 3/8" and 7/16". 8" to 19" (long length), ¼" and 5/16", 5/16" and 3/8", 7/16" and ½", 9/16" and 5/8", 5/8" and 11/16", ¾" and 7/8", 15/16" and 1"

(Continued on page 59A)



Both the Signet 300 and 500 models have the improved Geneva movement—smoothest, surest, swiftest filmstrip-advance ever designed!

Now...new, economical

Kodaslide Signet 300 Projector, Filmstrip Model

Do you want the smoothest possible filmstrip projection? . . . At a moderate price?

Then take a good look at this new Signet 300 Filmstrip Projector. Amply bright for most locations, its 300-watt rating makes it an able little brother to the super-brilliant Kodaslide Signet 500 Filmstrip Projector.

Frames advance fast as a flick, thanks to the unique, nylon-geared Geneva mechanism. Sprocket teeth are clearly visible to help you thread it easily and quickly. Even when it's necessary to load with cut or damaged film, the new enclosed mechanism will deliver top performance.

Yet for all this, the new Kodaslide Signet 300 Filmstrip Projector is priced at only $85.50. A strong, handsome, lightweight carrying case is also available.

7 MORE REASONS

why you'll like the new Signets

1. *f*/3.5, 5-inch *Lumenized* Kodak Projection Ektanon Lens (*f*/2.8 also available on Signet 500).
2. Two *Lumenized* close-coupled condenser lenses and aluminized glass reflector help collect and deliver brilliant, sparkling pictures to your screen.
3. Positive cam action assures safe plate separation before film can be advanced.
4. Rapid rewind device.
5. Supplied with automatic take-up slide changer, automatic slide sequence stacking. Accepts Kodaslide Box for group slide filing and storage; takes Airequipt Slide Changer; single-frame stereo adapter available.
6. Quiet impeller-type blower gives full-pressure cooling; aluminum heat-dissipating panels channel cool air over all internal surfaces; extra-thick heat-absorbing protective glass.
7. Sturdy, die-cast aluminum housing with controls located for greatest convenience.

WANT MORE INFORMATION? **See your Kodak Audio-Visual Dealer for full information about the new Signet 300 or 500 Filmstrip Projectors. He will be glad to arrange a demonstration at your convenience. Or just mail us the coupon for a completely detailed pamphlet.**

Price subject to change without notice.

EASTMAN KODAK COMPANY
Dept. 8-V, Rochester 4, N. Y. 3-193

Please send more information about:

☐ **Kodaslide Signet 300 Projector, Filmstrip Model**
☐ **Kodaslide Signet 500 Projector, Filmstrip Model**

NAME_____
TITLE_____
ORGANIZATION_____
STREET_____
CITY_____ **(Zone)** **STATE**_____

Kodak
TRADE-MARK

VEMCO drafting machines give vocational students "on-the-job" experience

Vocational education departments, equipped with VEMCO professional size drafting machines, are training students with the same type of drafting equipment industrial employers will expect them to use.

Built for Long Service

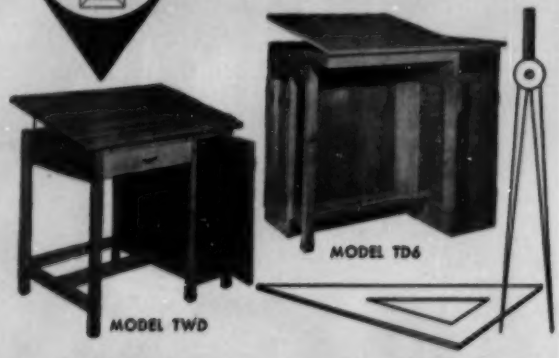
Permanently sealed ball bearings.
Pulleys and housings machined die castings.
Hardened steel, ground index plate.
Steel bands — continuous, no joints.

See your VEMCO dealer, or write:

V. & E. MANUFACTURING CO.
Education Dept. A
P.O. BOX 950-M • PASADENA, CALIFORNIA

VEMCO
Drafting Equipment of Quality

TOLCO DRAFTING and DRAWING TABLES

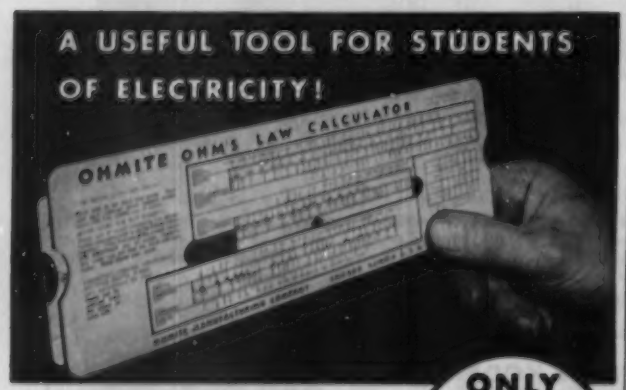


Your Drafting Room or Art Department will be better equipped when you specify PRECISION BUILT TOLCO units. The many different Tolco models are built and finished to give years of maintenance free service. Northern Hard Maple frames—bolt reinforced mortised and tenoned joints—adjustable warp free work surfaces. There is a Tolco unit just right for your school and budget.

Write For Complete Information

THE TOLERTON COMPANY
265 NORTH FREEDOM AVE. ALLIANCE, OHIO

OHM'S LAW CALCULATOR AND SLIDE RULE



ONLY 25¢
TEACHERS! ONLY 15¢ each in quantities of 25 or more

A time-saving calculator for your students after they have learned Ohm's Law. Solves Ohm's Law and many parallel resistance problems simply, quickly, accurately—with only one setting. Slide rule scales multiply, divide, find squares, square roots, etc. Only 9" x 3", heavy varnished cardboard, it fits handily into the pocket. Also available in durable vinylite at $1.50.

OHMITE MANUFACTURING CO. 3656 Howard St., Skokie, Ill. (Suburb of Chicago)

Have you met the teachers' pet? BERGER all-in-one drafting kits

Berger Drafting Kits are at the "head of the class" with instructors everywhere. And with students, too. With the Berger Drafting Kit, students are fully-equipped with every tool they need . . . every day. Sessions get underway promptly without students begging the loan of a protractor, a triangle, a scale. It's today's indispensable teaching aid.

Tell your students about the Berger Kit — costs less than buying the items individually.

PAT. PEND.

Recommended and used in hundreds of schools.

BERGER DRAWING SET #510 Complete — high-grade scholastic set; in velvet lined case. Price including complete kit — $11.00.

T-710A With interchangeable nickel silver master bow — $9.40.

Prices quoted are for quantities of 6 or more kits. Instructors may buy sample kit at same low price.

YOUR CHOICE OF 8 DIFFERENT TYPE DRAWING SETS — PLUS

Protractor	French Curve
Architect's Scale	Draftsman's Tape
Engineer's Scale	Pencil Pointer
8" Triangle	2 Drawing Pencils
10" Triangle	2 Erasers

Inner compartments hold drawing and note papers — all in attractive, durable 16" x 24" simulated leather 3-way zippered carrying case of scuff-proof, water-proof Texon with slide-in type handles.

Write for literature and complete prices.

BERGER SCIENTIFIC SUPPLIES, INC.
37 Williams St., Boston 19, Mass.
Materials and Equipment for Engineers, Architects, Surveyors, and Draftsmen

AUTOMOTIVE EQUIPMENT

(Continued from page 56A)

WRENCHES, ELECTRICAL
Open end, double end, thin chrome-moly forged steel, chrome plated electrical set of 9: $^{13}/_{64}$" to $^{5}/_{16}$" openings

WRENCHES, SOCKET
½" square drive and/or ⅜" square drive, thin wall, double broached, chrome alloy heat treated sockets. Chrome plated finish, 4 to 8 sets: $^{7}/_{16}$", ½", $^{9}/_{16}$", $^{9}/_{16}$" extra thin for Ford V-8 85 h.p. connecting rods, $^{19}/_{32}$", $^{5}/_{8}$", $^{21}/_{32}$", $^{11}/_{16}$", ¾", $^{25}/_{32}$", $^{13}/_{16}$", ⅞", $^{15}/_{16}$"

WRENCH, HANDLE
11" — ½" and/or ⅜" square drive sliding "T" handle, alloy steel, lock-in plug connector

WRENCH, EXTENSION DRIVE
1. 5" — ½" and/or ⅜" square drive extension, alloy steel, lock-in plug connector
2. 10" — ½" and/or ⅜" square drive extension, alloy steel, lock-in plug connector

WRENCH, RATCHET (Reversible)
Ratchet gear, ½" and/or ⅜" square drive, quick reversible. Lock-in plug connector

WRENCH, DRIVE ADAPTER
1. ⅜" square female and ½" square male
2. ⅜" square male and ½" square female

WRENCH, TAPPET ADJUSTING
1. ⅓" — $^{9}/_{16}$" open end, thin alloy steel wrench
2. ⅝" — $^{11}/_{16}$" open end, thin, alloy steel wrench

WRENCH, UNIVERSAL JOINT
1. ⅜" and/or ½" sq. drive

Special Equipment and Testing Devices

Most of the special equipment used in the auto shop will last for a long time. Such things as compressors, grinders, welding torches, and creepers will stand up for many years with a minimum of periodic service.

Testing devices are more delicate and, consequently, more expendable. They must be repaired or replaced regularly. . . . It is of vital importance that meters, analyzers and testers be of the type used currently in the industry. The advice of local service people will be of great assistance when considering what types to procure.

AIR COMPRESSOR
1. 5 h.p., 26 cu. ft. min. capacity, max. pressure 150 PSI, complete with steel tank, regulator, pressure unloader, safety valve and piping
2. Air blow gun — forged brass, button valve type, 25 CFM at 100 PSI, specify hose size
3. Air line chuck — ball foot type with serrated shank. Specify hose I.D.

ALIGNING JIGS — for connecting rods

ARBOR PRESS — 25 ton hydraulic

BATTERY EQUIPMENT
1. Batteries, storage — automobile 6 volt, 100 amp. hour capacity; 12V, 50 amp. hr.
2. Battery carrier
3. Battery charger, tube rectifier type, 6 amp. capacity for 12 6-volt or 6 12-volt batteries
4. Battery charger, fast charger selenium rectifier type with charging rate controlled by battery temperature
5. Battery hydrometer with built-in thermometer
6. Battery syringe to water cells
7. Battery voltmeter, high rate discharge O-3V, high capacity resistance unit, prong type

BENCH
1. Electric test — facilities for testing: generators, regulators and starting motors, 3 h.p. min. motor, variable speed drive for approximately 500–6000 r.p.m. tachometer, voltmeter, ammeter, shunts and resistors
2. Work, with vises (4" vise)
3. Work, portable with vise

BRAKE EQUIPMENT
1. Lining grinder with necessary adapters to grind and centralize car brake shoes
2. Drum lathe with necessary attachments for both turning and grinding, including brake cylinder hones, lining clamps, and brake drum micrometer
3. Reliner — combination riveter and grinder
4. Lining bonder and remover (check electrical supply)
5. Brake bleeder

CONTAINERS
1. Can, safety gasoline — 1 gal. 24 ga. lead coated, non-spill sealed. Trigger type pouring lip
2. Can, waste — galvanized 12" x 15" can with legs and spring lift cover

CHAIN HOIST — with overhead trolley and monorail, 3 ton capacity

CLEANER
1. Steam — low pressure type (check local code)
2. Ring groove cleaner

CORD EXTENSION LIGHT
Complete with molded rubber handle and socket. 20 feet super-service cable, molded rubber attachment plug and lamp guard

COMPASS — magnetic type needle

(Continued on next page)

C&P NEW SERIES PRESSES These presses in sizes of 8x12, 10x15, 12x18 and 14½x22, provide the student with equipment that furnishes all practical requirements of hand fed press operation. May be equipped with flywheel, belt and platen guards. Also furnished for treadle operation instead of motor drive.

CHANDLER & PRICE
PRESSES and PAPER CUTTERS

C&P BENCH CUTTER An efficient, small size cutter that handles sheets up to 19" x 24". Equipped with two-handed safety control.

The Standard for Printing Education

C & P presses and paper cutters have been standard equipment in commercial plants and schools for over 50 years. So, the selection of C & P equipment for printing classes places before the students *practical* equipment exactly as used in commercial practice in the entire printing industry.

In addition, special safety features are incorporated, when desired, in C & P presses and paper cutters so that all safety requirements are fully satisfied.

For practical instruction—for safety in use—the foresighted administrator recommends . . . Chandler & Price.

"HANDBOOK OF PLATEN PRESSWORK" is one of the outstanding aids to printing furnished without charge to printing instructors. If you do not have a copy, just request one.

C&P PILOT PRESS A thoroughly efficient little press, chase 6½x10, that teaches basic principles of press operation with exceptionally fine printing results.

THE CHANDLER & PRICE COMPANY
6000 CARNEGIE AVENUE • CLEVELAND 3, OHIO

AUTOMOTIVE EQUIPMENT

(Continued from previous page)

CREEPERS — 4 universal casters attached for easy movement

DEGREASER — with drum, filter and pump type circulated cleaning fluid

DRILL
1. Electric portable, ¼"
2. Electric portable, ½"
3. Press, 21", with motor and chuck

DYNAMOMETER
1. Chassis hydraulic absorption type
2. Engine hydraulic absorption type

ENGINE LIFTING EQUIPMENT — specify engine lift is to fit

ENGINE SUPPORT BARS — specify engine bars are to fit

FENDER COVERS

FURNACES — gas soldering

GAUGES
1. Cylinder gauge — dial indicator, universal type attachments complete in storage container
2. Compression meter, dial face for use in spark plug chamber

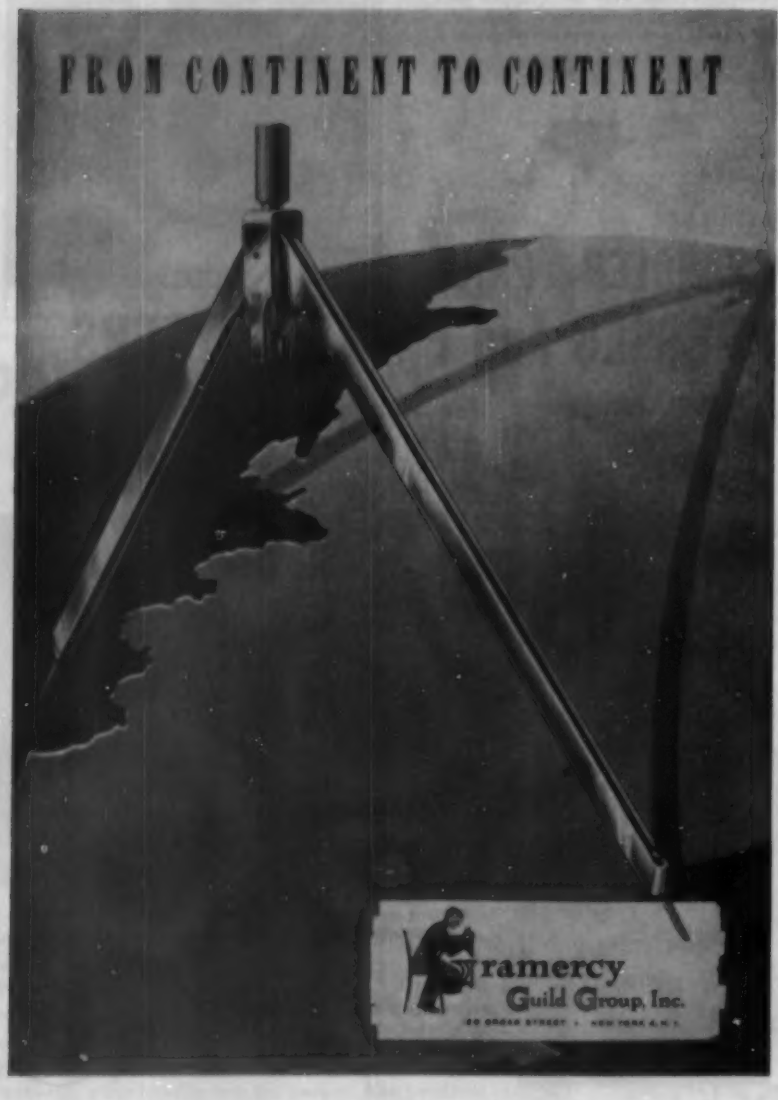
GREASE DISPENSERS (chassis pressure type)

GRINDER
1. Cylinder, with motor and hone
2. Electric bench grinder, 2 six-inch dia. wheels, complete with motor, switch, guards and tool rests

GROWLER — 110 V-60 cycle, for testing generator and starter armatures

HONING MACHINE
Electric motor driven, for piston pins, king pins, etc., capacity to hone holes from ⅛" to 2½" inside diameter

HOT PLATE — electric — 110 V-60 cycle



JACKS
1. Floor roller, hydraulic type, 2 ton
2. Hand stationary hydraulic type, 1½ ton

LATHE — Metal bench type, 9" swing, back geared, motor driven

LIFTS
1. Automobile, hydraulic, twin post
2. Automatic transmission, hydraulic lift

MAGNET — permanent bar type ¼" x 1" x 6"

METERS
1. AVR 75 ampere D.C. 6, 12, and 24 volt scales d.c. complete with standard load resistor. Encased in durable portable case with heavy leads and clips attached
2. Meter, ammeter — 30 amp. capacity, encased in shock proof case
3. Meter, voltmeter — 10 volt rating

RADIATOR HYDROMETER — calibrated for alcohol, glycerine and ethylene glycol with built-in thermometer

SPRING TENSION SCALES
1. Brush and point spring tension scale 0-48 oz. spring type draw scale with hooked prong
2. Steering gear checking scale 0-4 lbs. spring type draw scale with steering wheel grip

STANDS
1. Car stand (horse) — 2 ton min. cap.
2. Engine build up stand, supported to swing through 360°, mounted on casters with locking device
3. Rear axle overhaul stand

TESTERS
1. Coil tester to measure continuity, capacity, and resistance. Tester complete with coil heater and circuit interrupter — for hot and cold tests
2. Condenser tester to measure continuity, resistance, and capacity of condensers
3. Distributor tester, portable type complete for static and dynamic tests. For testing point resistance, dwell, mechanical spark advance and vacuum advance
4. Motor tester analyzer, facilities for testing battery, starting voltage and current, cylinder compression, intake vacuum, ignition coil, condenser. Complete with tachometer, dwell meter, volt-amp-resistance and combustion tester
5. Power light tester. Synchroscope three lead type for making dynamic ign. timing
6. Spark plug cleaner and tester
7. Head light tester for focusing and adjusting headlight beam
8. Thermometer tester. Fahrenheit scale, glass tube mercury type. Scale 0° to 300° F.

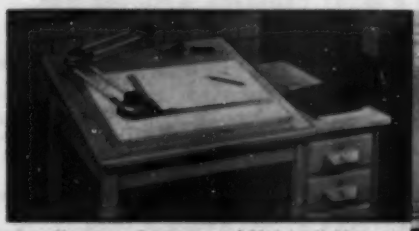
TIRE SERVICE
1. Bead expander to compress crown of tire to force beads of tubeless tire against rim
2. Tire changer with bead breaker and roller
3. Tire gauge
4. Tire tester (water tank)
5. Tire repair kit (Tubeless)

VALVE RECONDITIONING EQUIPMENT
1. Valve refacer, electric. Motor driven grinding wheel. Universal motor driven valve stem chuck, mounted on adjustable feed base. 9/16" capacity, angle adjustment 30° to 90°. 110V, 60 cycle motors. Bench type
2. Valve seat grinder, complete with stones for popular car sizes
3. Valve spring compressor, adjustable for L head engines
4. Valve spring compressor, adjustable for overhead valve engines

WELDING UNIT
1. Portable oxyacetylene welding unit complete with 2 wheel carrier with cylinder holder device. Including: acety-

(Continued on page 62A)

Industry Urges...
TRAIN THEM WITH DRAFTING MACHINES!



Mounts and removes quickly! Available with or without folding drawing board.

SPECIAL SCHOOL DISCOUNTS

Folds into student's drawer!

20 Desk-Toppers in action in the drafting room at Modesto Junior College, Modesto, California. Rex W. Waymack, Instructor, Engr. Drwg. Installed by Eugene Dietzgen Co., San Francisco, Calif.

According to an independent survey, 76% of industrial drafting rooms questioned use drafting machines — and 63% use the drafting machine exclusively! Recognizing the urgent need for proper training on the drafting machine, leading schools, colleges and universities are installing new Universal Desk-Topper drafting machines . . . designed for school-size drawings and priced to meet school budgets. (Made by the makers of Universal Boardmaster . . . the drafting machine preferred by industry.)

See your drafting materials dealer or write direct

UNIVERSAL DRAFTING MACHINE CORP.
7960 LORAIN AVENUE • CLEVELAND 2, OHIO

master medium for any technique

The International Standard Since 1880

In waterproof Black (India Ink) soluble Black and 17 waterproof Colors

HIGGINS INK CO., INC.
BROOKLYN, NEW YORK

MAYLINE

S-T-R-E-T-C-H Your Classroom Furniture Budget

C-7702 ART TABLE

Have budget troubles? Can't obtain enough tables? Let Mayline show you how to buy basic equipment now and add completing units later, ease budget strain.

C-7703B is complete table. Units can be purchased separately. Buy basic table C-7703. Later add board storage unit C-7720; finish with drawer unit C-7721. Or, buy table C-7702. May we quote prices!

Symbol of MAYLINE Superiority

MAYLINE COMPANY
623 No. Commerce St.
Sheboygan, Wisconsin

C-7703B DRAFTING TABLE

MAYLINE

AUTOMOTIVE EQUIPMENT

(Continued from page 60A)

lene regulator, oxygen regulator. Torch complete with tips No. 0, 1, 2, 3, 4, 6, 8, 10 and cutting attachment. Oxygen and acetylene hoses of 4 ply molded rubber with clamps. Welding goggles, nonmetalic, molded to fit facila contour, eye cups ventilated, adjustable nose band, No. 6, 50mm. safety lens and 50mm. clear protective lens. Fire extinguisher, trigger type, foamite type. (All equip. must be approved by National Board of Underwriters' Lab.)

WHEEL ALIGNMENT EQUIPMENT

1. Test rack with front pit preferred
2. 3-way alignment gauge set for camber, king pin inclination and caster, including adapter sleeve and clamp to fasten on to spindle. Also turning radius plates
3. Toe-in gauge
4. Wheel balancer. Type capable of testing static and dynamic balance of wheel on car

Special Tools

Special tools for servicing such equipment as automatic transmissions, power steering, and like devices should be requisitioned as required. Give complete purchasing specifications. This applies also to special pullers needed for steering wheels and other special tools.

Automotive Parts and Educational Units

This list of automotive parts should be consulted when developing the teaching devices or educational units which the student will use in preliminary training. His work and experience with these units will be of the laboratory type, in preparation for service work in the automotive service course.

These units must be modern, well maintained, and diversified so that the student can receive experience on all types and designs of similar equipment. An amortization schedule on this material is most important.

BRAKE ASSEMBLY — front and rear

Complete assembly including wheel, brake cylinder, linkage, and foot pedal for basic instructional unit on brakes. (Order mechanical hand, hydraulic, disc, etc., types which are used on current model cars.)

CARBURETORS

Current model carburetors used on popular model automobile engines

CHASSIS, AUTOMOBILE

1. Complete chassis with engine, starter, generator, regulator, and ignition system. All warning and electrical devices attached. (Basic instructional element for electrical work of all kinds.)
2. Chassis instructional element for front and rear suspension units, power transmission units including wheels and tires

DIFFERENTIALS

Complete with carrier, axles, and power drive. Order Hotchkiss drive and torque tube types. For assembly and disassembly

DISTRIBUTORS

Order distributors which are currently used on all popular automobile engines. Complete with distributor head, points, condenser, vacuum advance, automatic advance, and lube fitting (for use as basic training elements)

ENGINES

1. 6-cylinder overhead valve engine complete with clutch and transmission, ignition and fuel systems, in operating condition
2. 6-cylinder in line, L head engine complete with clutch and transmission, ignition and fuel systems, in operating condtion
3. 8-cylinder V-type engine complete with clutch, transmission, fuel and ignition systems, in operating condition
4. Any type cut away engine
5. Used engines for assembly purposes. To be mounted for dead engine work

FUEL PUMPS

Order fuel pumps used on current engines. Vacuum, mechanical, magnetic, etc.

GENERATORS

1. Order d.c. generators used on current model automotive engines complete with pulley and terminals, 6 and 12 volt types
2. Order a.c. high output generator with d.c. rectifier and regulator (used on automotive two-way communication circuits)

IGNITION COILS

Order coils used on current model automobile engines 6 and 12 volt types (for basic training elements)

IGNITION CONDENSERS

Order condensers used on current model automobile engines (for basic training elements)

REGULATORS

Order 2 and 3 unit regulators complete with volt, current, and cutout coils. In good operating condition (for basic training element)

STARTING MOTORS

Order starting motor types which are used on current model automobile engines. Order complete with starting switch (manual and automatic) and with engaging mechanisms (Bendix and overrunning clutch)

STEERING GEAR ASSEMBLY

Order steering gear assemblies used on cur-

(Continued on page 72A)

● New design, new features assure maximum efficiency in minimum space. The modern SPEEDMASTER makes it easy for anyone to print and develop exact, same-size black line or colored line whiteprints in volume as needed — continuously or intermittently. *Synchronized* printing and developing speed up to 14 ft. per min. Handles cut sheets or roll stock up to 44" wide in any length. P&H electronic drive provides instant speed change, with full stop and reverse control. Priced at $1495. New Model 2500C SPEEDMASTER 25 ft. per min. 44-inch, 230 volt ammonia-dry whiteprinter at $1995. Other whiteprint outfits from $79.50. Send for Bulletin 56S1.

P&H SALES CORP.

REPRESENTING

PECK & HARVEY MFG. CORP.

5649 N. WESTERN AVE. • CHICAGO 45

MFRS. OF WHITEPRINT, BLUEPRINT & PHOTOCOPY EQUIPMENT

Progressing with the Reproduction Industry Since 1937

DRAWING INSTRUMENTS

Illustrated is the VEMCO instrument set No. A171L, consisting of 6½" compass, 4½" compass, 6½" divider, pen attachment, Microliner ruling pen, and box of leads and points. Packed in smart California saddle leather pocket case.

AMERICAN MADE BY

VEMCO

(Parts always available)

All-steel construction of VEMCO drawing instruments provides lighter weight, as well as strength and rigidity necessary for the "heavy-duty" demands of modern drawing-room practice. VEMCO drawing instrument sets are available in different combinations to suit every drawing need.

Write today for your free copy of booklet "Historical Note on Drawing Instuments"

VEMCO

V. & E. Manufacturing Co.

Education Dept. R

P.O. BOX 950-M • PASADENA, CALIFORNIA

Drafting Equipment of Quality

Elliott's

NEW SCHOOL CATALOG

A complete selection to meet your school needs and your budget

•

DRAWING INSTRUMENTS
DRAFTING SUPPLIES
ART SUPPLIES

An Elliot Bid May Give You —the best buy

Mail Your Bid Forms To Us
For A Quotation

Write Today for FREE copy of new Catalog

B. K. ELLIOTT CO.

126 Sixth Street, Pittsburgh 22, Pa.
Cleveland • Detroit • Buffalo

FLEX-MASTER

***LIFETIME EFFICIENCY**
DRAWING TABLE
makes good your investment

Rigid welded steel stands up under hard use, even abuse! Boards equipped with zinc plated steel end cleats. Fingertip adjustment of board to any desired working angle. Large all-steel drawers operate smoothly on nylon glides. Hammertone enamel finish. Drawing surface 22" x 24", reference surface, 22" x 10"; also available with undivided top in many sizes. 30" to 37" heights. Also available with steel or hardwood tops.

***LIFETIME STEEL CONSTRUCTION**

Write today for NEW Catalog

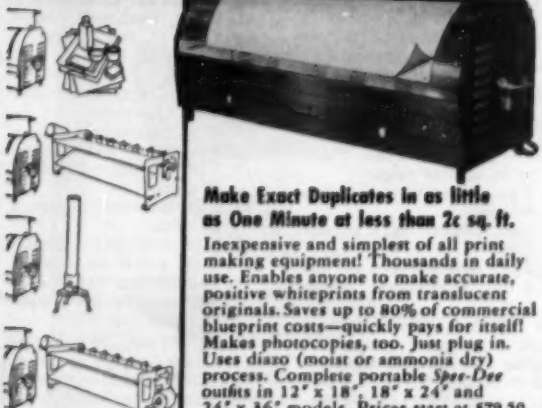
Manufacturers of Lifetime Steel Blue Print Filing Cabinets Drafting Tables, Tracing Tables, etc.

STACOR EQUIPMENT CO.

479 Troy Avenue, Brooklyn 3, N. Y.

Dealer Inquiries Invited

AMAZING! the Time and Money Saved WITH *Spee-Dee* WHITEPRINT OUTFITS



Make Exact Duplicates in as little as One Minute at less than 2c sq. ft.

Inexpensive and simplest of all print making equipment! Thousands in daily use. Enables anyone to make accurate, positive whiteprints from translucent originals. Saves up to 80% of commercial blueprint costs—quickly pays for itself! Makes photocopies, too. Just plug in. Uses diazo (moist or ammonia dry) process. Complete portable *Spee-Dee* outfits in 12" x 18", 18" x 24" and 24" x 36" models. Prices start at $79.50. Also a full line of 42" width capacity volume production whiteprinters at moderate prices.

Send For Bulletin SD54

P&H SALES CORP.

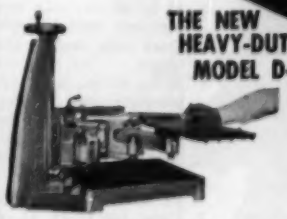
REPRESENTING
PECK & HARVEY MFG. CORP.
5649 N. WESTERN AVE. • CHICAGO 45
MFRS. OF WHITEPRINT, BLUEPRINT & PHOTOCOPY EQUIPMENT
Progressing with the Reproduction Industry Since 1937

unique in design — rugged in construction

GREEN PANTOGRAPH ENGRAVERS

THE FAMOUS MODEL 106

THE NEW HEAVY-DUTY MODEL D-2



The three-dimensional bench Model 106 cuts costs — engraves, routs, models and profiles, giving you expert results even by unskilled workers.

The Model D-2 two dimensional heavy-duty Pantograph is a precision machine with a multitude of new features. Open on three sides, it permits complete freedom for engraving, milling, profiling large panels (up to 30" in diameter) or bulky pieces. Single, micrometer adjustment controls vertical depth of cut, automatically adjusting copy table with pantograph. Range of reduction ratios from 2-to-1 to infinity! Vertical range over 10 inches!

For complete information, write to

GREEN INSTRUMENT COMPANY
388 Putnam Ave. Cambridge, Mass.

Print-Shop Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent and sound movies may be used by the students in the industrial arts and vocational education courses.

BELLOWS
1. Hand, small size
2. Electric, blower type

BOOKCASE — for reference books, catalogs, etc., sectional preferable

BRAYER — 6 or 8 in. for proofing

BRUSHES
1. Bench
2. Benzine, No. 1, oval black
3. Floor
4. Padding, 1½ in. wide

BULLETIN BOARD

CABINETS
1. Galley, for double column, wood or steel, four tiers (to be used with typesetting machines)
2. Galley, for 8¼ by 13 in. galleys, wood or steel, four tiers
3. Ink and roller, to accommodate platen-press rollers, wood or steel
4. Matrix, for use with typesetting machines only
5. Roller, cabinet or rack for cylinder rollers
6. Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
7. Type, school type, each to accommodate two California cases, job cases, case slides, galley slide, and copyholder
8. Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
9. Type, complete with 24 full-size California job cases, double work bank, wood or steel
10. Wood or metal, for filing class records, instruction sheets, etc.
11. Storage for cuts

CANS
1. Benzine, pint size
2. Benzine, 5-gal. size
3. Kerosene, safety, 1-gal. size
4. Waste can, fireproof, for rags

CASES
1. Blank, full-size, to accommodate ¼-size cases
2. Border, ¼-size, for ornamental borders
3. Lead and slug, regular size, to hold laborsaving fonts of leads and slugs
4. Metal furniture, to hold labor-saving fonts
5. Rule, ¼ size, for brass rule

CHAIRS — teacher's and tablet arm

CHALKBOARD — permanent or portable

CHASE RACKS
1. For platen presses
2. For cylinder presses

CHASES
1. For each size of platen press
2. For cylinder press

COMPOSING STICKS — 6 by 2 in., 8 by 2 in., 12 by 2 in., and 18 by 2 in., adjustable

CUTTER
1. Lead and rule
2. Paper, lever type, 20 in., with pedestal. Should handle 20 by 26-in. sheet
3. Paper, lever type, 26 or 30 in.
4. Paper, lever type, 30 in., with divided back gauge
5. 30 in. to 36 in. power cutter

DESK
1. Bindery, 80 by 36 in.
2. Drying rack
3. Imposing, 51 by 30 in.
4. Make-ready, 32 by 24 in.
5. Paper cutters, 80 by 36 in.
6. Proofreaders
7. Teacher's

DRYING RACKS
1. Combination drying rack and stock table for platen presses, 30 trays
2. Trays, interlocking, for cylinder press

FOLDING BONES — for hand folding

FOLDING MACHINE — 20 by 26-in. size, 4 fold, two parallel and two right-angle folds, power

FURNITURE — iron, 2 by 4 to 10 by 15 picas

GALLEYS — Steel, 8¼ by 13 in., 6¼ by 23½ in., double column, and 12 by 18 in.

GAUGE PINS — spring tongue

GLUE POT — electric, 1-qt. size

IMPOSING TABLES
1. 12 by 18 in., with iron top, including reglets and furniture
2. 24 by 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
3. 36 by 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
4. 39 by 63 in., with iron top, complete with drawers, letter boards, reglets, and furniture

INK FOUNTAINS
1. Short, for 8 by 12, 10 by 15, and 12 by 18 presses
2. Long, for 10 by 15, and 12 by 18 presses

KNIVES
1. Overlay, for make ready
2. Ink, 6 and 8 in.
3. Ink, 8 in., square end

LEADER BOXES

LEADERS
1. 6, 8, and 10 pt., fine dot
2. 8 and 10 pt., hyphen

LINE GAUGES
1. Metal, brass, or steel
2. Wood

MALLET

METAL FURNACE — for recasting and refining type metal, used only with typesetting machines

MITERING MACHINE

NUMBERING MACHINES
1. For use on presses
2. Hand machines

ORNAMENTS
1. Assorted floral and decorative designs
2. Border, 6 and 12 pt., decorative

PAPER-DRILLING MACHINE

PERFORATOR
1. 24-in., foot treadle
2. 28-in., foot treadle

PLANER
1. Mallets, hickory or fiber
2. Proof, maple, with felt bottom
3. Type, maple with leather top

PRESSES
1. Cylinder, two revolution, four roller, 17 by 22, complete with variable-speed motor, cast rollers, etc.
2. Platen, 8 by 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
3. Platen, 10 by 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
4. Platen, 12 by 18, complete with variable-speed motor, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
5. Proof, 14 by 18, with cabinet
6. Proof, 20 by 24, with cabinet
7. Proof, 23 by 24½, with cabinet
8. Tableting

PUNCH
1. Foot power, multiple with assorted punches
2. Lever, two die, with assorted punches
3. Power, multiple, with assorted punches (paper drill may be substituted)

QUOINS
1. Sizes No. 1 and No. 2
2. Keys, Sizes No. 1 and No. 2

RULE — plain and brass (fonts to fit quarter cases)
1. 2 pt., laborsaving, hair line, side face
2. 2 pt., laborsaving, 1 pt. side face
3. 1 pt., laborsaving, 1 pt. face
4. 2 pt., laborsaving, double face

SAW TRIMMERS — pedestal type, with point gauge, and raising and lowering table

SILK-SCREEN UNIT

SPACING MATERIAL
1. Iron furniture, as selected
2. Leads, laborsaving, 2 pt.
3. Leads, 2-ft. strips, 2 pt.
4. Slugs, laborsaving, 6 pt.
5. Slugs, 2-ft. strips, 6 pt.
6. Spaces and quads
7. Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

SPECIMEN DISPLAY BOARD

STAPLE BINDER — pedestal type, foot power

STEREOTYPING UNIT, 8 by 12 in.

STITCHER — wire, power, capacity ½ or ¾ in., flat- and saddle-back tables

TWEEZERS — 3½ in.

TYMPAN PAPER (with combination holder and cutter)
1. 18 in.
2. 38 in., upright, to be used with cylinder press only

TYPE
1. Body, lightface — 8 and 10 pt.
2. Job lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
3. Job lightface italics — 8, 10 12, 14, 18, 24, and 36 pt.
4. Job boldface — 6 and 8 pt., 12 pt., No. 26; 12 pt., No. 27; 12 pt., No. 28; 18 pt., No. 30
5. Job, light copperplate Gothic — 6 pt., Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
6. Job condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
7. Job text type — 10, 12, 14, 18, and 24 pt.
8. Job, typewriter type — 12 pt. with spaces
9. Job, boldface italic — 8, 10, 12, 14, 18, 24, 30, and 36 pt.
10. Job, heavy copperplate Gothic — 6 pt., Nos. 21, 22, 23, and 24; 12 pt., No. 25
11. Wood, condensed Gothic — 8, 12, 15, and 18 line
12. 10 pt. line leaders 4 dots to the em
13. 10 pt. braces and dashes
14. 10 pt. fractions
15. 10 pt. references
16. Parentheses and brackets
17. 2 pt. laborsaving leads, 4 to 25 picas
18. 6 pt. laborsaving slugs, 4 to 25 picas
19. 2 pt. laborsaving brass rule
20. 2 pt. miters for rule
21. Laborsaving metal furniture
22. Thin spaces with quarter-size case

TYPESETTING MACHINES
1. Either linotype or intertype, 2 or 3 magazines, and molds
2. Matrices for same, 6, 8, 10, and 12 pt., as selected

VISUAL AID CHARTS

Print-Shop Supplies

BENZINE OR GASOLINE — for cleaning type or presses

BINDERY TAPE — 2 in. wide, brown or black

GOLD BRONZE — pale

INK
1. Bond, black, for bond papers
2. Book, black, for school papers, etc.

(Continued on page 66A)

CHALLENGE PAPER DRILLS
Challenge's single-spindle, heavy-duty design provides (a) minimum center-to-center spacing between holes; (b) faster setup; (c) plus the accuracy and economy of a single hollow drill — in a complete range of styles, from the hand operated bench model to Challenge hydraulically powered drills.

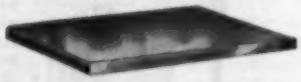
CHALLENGE PROOF PRESSES
As leading exponents of the "Cylinder Press" principle of reciprocating bed on anti-friction rollers, Challenge presses always produce the highest quality work — whether it's on a small proof press with inking roller or the new, heavy-duty automatics featuring automatic grippers, automatic trip, and automatic inking.

Challenge

in all the world

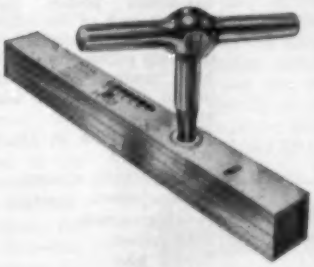
- **NO FINER PRINTING EQUIPMENT**
- **NO FASTER SERVICE**

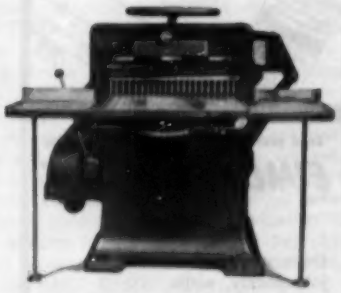
LABOR-SAVING IRON FURNITURE
Full line of standard sizes. Also, made-to-order.



IMPOSING SURFACES
Precision ground semi-steel. With or without rabbet.

HI-SPEED QUOIN
SAVES up to 80% lock-up time. Self-contained . . . direct expansion . . . no reglets . . . no work-ups.





CHALLENGE PAPER CUTTERS
For over half a century, Challenge has set the standard of excellence — in both hand operated and power-operated paper cutters. All 11 styles and 7 sizes are machined to close tolerances and embody features designed for fast, safe, easy operation.

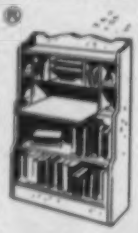
795

Dealers in all Principal Cities.

Challenge
TRADE MARK

THE CHALLENGE MACHINERY CO.
Over 50 years in Service of The Graphic Arts Office,
Factories and Show Rooms: Grand Haven, Michigan

Repairing? Indoors? Building? Outdoors?
Glue it Best WITH ELMER'S

Make this bookcase "Hide-a-Desk" with
ELMER'S® GLUE-ALL
A handsome piece in any room! Build it strong with ELMER'S modern plastic glue. Handy squeeze bottle speeds job. Quick-setting. Won't stain. Ideal for wood, paper, cloth.


[GLU-BILD® Pattern #10. Just trace, easy assembly. Send 25¢ in cash or money order to Elmer's Pattern Dept., P. O. Box 25, Pleasantville, N. Y. *T. M. Reg. Cont-Bild Pattern Co., Inc.

Build or repair boats, outdoor furniture with
ELMER'S® Waterproof Glue
It's the glue that boating experts use. Resistant to acids, alkalis, fungus, rot. Super bond is stronger than wood itself.

Bond plastic laminates to plywood with
ELMER'S® CONTACT CEMENT
Does professional job quickly, without clamps, nails, presses. Highly resistant to heat, water. Outperforms other contact cements in stress tests.

At hardware, lumber, paint, marine supply dealers. The Borden Company, Chemical Division
IF IT'S Borden's IT'S GOT TO BE GOOD

(Continued from page 64A)

3. Cover, colors as selected
4. Dryers and compounds, as selected
5. Half tone, black
6. Job, colors as selected
7. Metallic, gold and silver
8. Process, black, red, yellow, blue

KEROSENE — for cleaning rollers

PADDING CEMENT
1. Cold
2. Hot

PAPER
1. Bond, fine grade, 17 by 22 — 20, white
2. Bond, medium grade, 17 by 22 — 20, white
3. Bond, sulphite, 17 by 22 — 20, white
4. Bond, sulphite, 17 by 22 — 20, colors as selected
5. Book enamel, 25 by 38 — 80, white
6. Book, machine finish, 25 by 38 — 80, white
7. Book eggshell finish 25 by 38 — 60, white
8. Cover, as selected, 20 by 26, medium
9. Card Bristol, fine grade, 22 by 28 — 4 ply, white
10. Index Bristol, medium grade, 25½ by 30½ — 110, white
11. Index Bristol, medium grade, 25½ by 30½ — 140, white
12. Mill Bristol, medium grade, 25½ by 30½ — 140, colors as selected
13. Pressboard, red
14. Strawboard, No. 40 or No. 50
15. Tagboard, manila, 24 by 36 — 140
16. Tympan, to fit presses
17. Wrapping paper, size as selected
18. Holder for same

PASTE
1. Bindery
2. Make ready

SILK-SCREEN SUPPLIES consisting of:
1. Silk-screen process paste paint, 1 each of the following colors: toluidine red, strontian yellow, ultramarine blue, medium green, rich brown, orange, purple, white and black
2. Solvent profilm in 11- by 14-in. sheets
3. 8-in. synthetic squeegee
4. 11-in. synthetic squeegee
5. No-clog varnish
6. Film solvent
7. Stencil filler
8. Filler remover
9. Stencil knife
10. Fiber guides
11. Red sable brush — ½ in.
12. Putty knife
13. Frame tape

TWINE — cotton, for tying jobs

WIRE STITCHING
1. No. 28 round wire for stitcher
2. Wire staples, ¼ in.

NEW! craftool DUSTMAN
Takes the sawdust and dirt out of shop work AT THE SOURCE!
Attaches to any machine!
only $89.50
Complete with ⅓ HP ballbearing capacitor thermal protected motor, hose, fittings, switch and hood. (Waste can not included.)

MODEL 711
See what a difference Dustman will make in the school shop — no more messy, littered floors, no more wasting of valuable teaching time on hours of cleanup. Just connect Dustman to any machine — and it gathers up all sawdust, wood chips and metal shavings the instant they're formed at the source. Then it discharges them into a waste can — and your shop is clean, the air healthfully pure and dust-free.
Dustman can also be used as an exhaust system or as a heavy duty vacuum for cleaning shop floors. Specially designed 8" pressure blower has the power to pick up large debris that an ordinary vacuum can not. Sturdily constructed with no exposed parts . . . quiet running . . . no greasing or oiling necessary. At its amazing low price there is no need to deprive your shop of the great convenience and cleanliness that Dustman affords.

Model 811
• FITS ON AN ORDINARY WASTE CAN! OR SUPPLIED WITH FIBRE DRUM (MODEL 811 — $89.50 — not adaptable to metal waste can.)
• PLUGS INTO ANY AC OUTLET!
• COMPLETELY PORTABLE — MOVE IT FROM MACHINE TO MACHINE WHEN NEEDED!
Perfect for Saws – Sanders – Multi-Purpose Tools – Radial Saws – Portable Tools, etc.
Send for complete Craftools Dustman Catalog 1A
CRAFTOOLS, INC.
Manufacturers of a complete line of equipment for the school shop.
401 BROADWAY • NEW YORK, N. Y.

Now . . . **the textbook on mechanical drawing you've wanted and needed for years!**

DRAWING and PLANNING for INDUSTRIAL ARTS

Here is the NEW . . . MODERN . . . REALISTIC approach to mechanical drawing. This new and outstanding textbook is written specifically for students enrolled in shop and drawing classes that are a part of general education. Over 2½ years in preparation, it's the result of constant contact with students . . . and based on over 100 courses of study from carefully selected school systems in the United States. It's the answer to the modern teacher's demand for a textbook that makes the learning of drawing *simple rather than difficult . . . genuinely easy to understand.*

Completely Flexible

Can be used either as a textbook from 7th grade through high school . . . or as a reference book in any unit shops that do any drawing or planning. Starts with the beginner — tells why drawing is important in everyday life; how to design, draw and plan. Tells how drawing is done so as to plan or represent a concrete object — a clear-cut, direct, functional approach rather than a complicated set of ideas or feelings.

OUTSTANDING FEATURES

- **Has more on PLANNING and development of MODERN DESIGN than any other drawing textbook!**
- **Contains 687 fine illustrations and photographs!**
- **Thoroughly integrates drawing with other courses in industrial arts — woodworking, metalworking, electricity, graphic arts, arts and crafts!**
- **Presents more than 200 motivating and up-to-date projects!**
- **Each chapter contains a preview, questions, topics for discussion, self-checking and applying what has been learned!**

Relates problems and activities to subjects with student interest — hobbies, sports, home and recreational activities. Covers the application of drawing and planning to the areas of woodworking, metalworking, electricity, graphic arts and arts and crafts.

Meets Industrial Arts Drawing Objectives

Specifically meets the objectives of industrial arts drawing by including orderly step-by-step procedures, good designs and plans, the use of tools and materials, outstanding ideas for initiative and resourcefulness, etc. Provides a wide variety of interesting experiences for all students in a unique, generalized course. Each chapter contains a preview, questions, topics for discussion, self-checking and applying what has been learned. Follows American standards of draftsmanship throughout. 687 fine illustrations . . . over 200 stimulating projects. *Examine this truly outstanding textbook — check coupon for FREE EXAMINATION. By John L. Feirer. $3.96.*

New . . .

WOODSHOP TOOL MAINTENANCE

Without equal — an outstanding, up-to-date and complete coverage of the maintenance of woodworking machines and tools. Enables those who use woodshop equipment to analyze and solve everyday problems — no other book explores the subject so thoroughly and so graphically.

A profusion of illustrations! Nowhere are there so many sharp photographs, clear drawings and understandable diagrams that show exact methods of sharpening saws . . . power saw blades . . . chisels . . . gouges . . . and the host of other tools used in the woodworking shop. In addition, there is a veritable treasury of photographs of machine parts to simplify maintenance procedures. After performing several of the maintenance jobs outlined, the student develops the knowledge required to cope with variations in maintenance problems caused by differences in manufacturers' products — A MOST VALUABLE FEATURE OF THIS BOOK! Divided into two main parts for handy use — maintenance of hand tools and maintenance of power tools. An excellent textbook for colleges and technical schools . . . and an ideal handbook for any woodworker or shop teacher. Over 350 large (7" x 10") pages; over 400 illustrations. *By BERYL M. CUNNINGHAM and WILLIAM F. HOLTROP . . . $5.76.*

Revised . . . 1956

INDUSTRIAL-ARTS ELECTRICITY

Lush and Engle $2.56

New . . .

MAKING THINGS OF WOOD

A wonderful new refreshing book that's the result of the authors' experience of many years in teaching junior high school industrial arts. This is a PROJECT BOOK for the beginning shop student — from the simple to the more complex — requiring minimum materials, but providing a wealth of opportunities for learning-by-doing experiences.

Many of the projects combine wood with metal, electricity and plastics. Each includes an easy-to-read drawing, bill of material, construction procedures and photographs. Procedures are not too detailed, serving merely as a guide so that the student is provided with planning experiences. Includes chapters on project selection, teaching aids and finishes — providing valuable information which applies directly to the projects in the book. Nearly 140 clear illustrations show finished projects and methods of doing work. *By LYLE P. SOETEBER and PAUL R. MOORE . . . $3.00.*

FREE

CHAS. A. BENNETT CO., Inc.
875 Durec Bldg., Peoria, Illinois

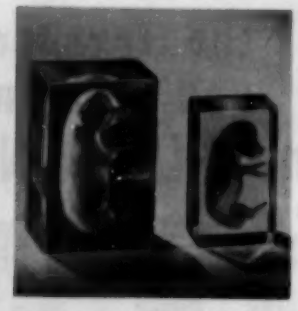
Send: ☐ DRAWING AND PLANNING FOR INDUSTRIAL ARTS @ $3.96
☐ WOODSHOP TOOL MAINTENANCE @ $5.76
☐ INDUSTRIAL-ARTS ELECTRICITY @ $2.56
☐ MAKING THINGS OF WODD @ $3.00

$..... enclosed. ☐ Send C.O.D. ☐ Send for exam.
(Copies sent for examination are billed to you, but may be returned, if not wanted, for full credit within 30 days.)

Name.....
School.....
Address.....
City..... State.....

"Ceramic" tabletop was made of Castoglas in shades of blue-green interspersed with gold and copper mottled sections. Legs and edge are brass.

Eighth grade students of Archbold, Ohio, under guidance of science teacher Gerald Ernst, formed this manikin of Castoglas and fiberglass.



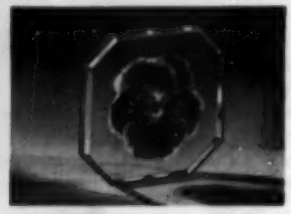
Pig embryos, stained and cleared, were embedded in clear Castolite by medical students, Department of Anatomy, School of Medicine, University of Ill.

Distinctive jewelry combines rare woods with Castoglas and Castolite. Who would ever guess that this is the same resin used for patching concrete floors.

Decorative Table Tops of Fiberglass laminates and colorful textile fabrics are combined with wood and metal legs. Rectangular table is wood-bamboo mat-fiberglass combination.

Colorful Candy and Fruit Dishes are beginners projects described in the new school folder. Designs were silk-screened between layers of fiberglass fabric.

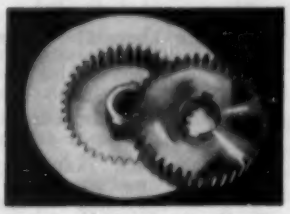
Key Tags Containing Embedments of four leaf clover, fish fly and gold initials. Easily made and inexpensive, they are excellent take-home projects.



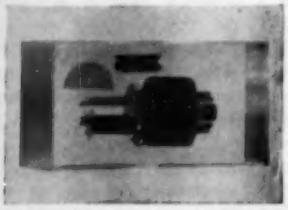
A Real Pansy Flower, its beauty permanently preserved in Castolite. Castings like this make distinctive coasters, paper weights and bookends for your own use or for gifts.

A Modern Fiberglass Chair. Complete illustrated instructions for laminating a fiberglass chair over a plaster mold are published in the March 1955 CASTOLITER. 10¢ per copy.

This 12-foot All-Fiberglass Boat Weighs Only 115 Lbs. Our manual, "How to Build Fiberglass Boats" gives step-by-step photographic directions. Manual is 25¢ a copy.



Gear Reproduction in Clear Castolite was cast in Castomold flexible mold compound, another product of The Castolite Co. The process is described in the school folder featured below.



Visual Education Par Excellence. Exploded view of radio tube embedded in Castolite. This and other projects were made by boys in Junior High School.

YOU CAN MAKE IT WITH Castolite LIQUID PLASTICS

William Woers

It has been a wonderful and stimulating experience to share our adventures in modern chemistry with groups of teachers and students. The most popular demonstrations were the shaping of a colorful bowl and the casting of jewelry and tiles. Everyone was fascinated, watching the reaction of two chemicals converting a honey-like liquid into solid form, clear as glass or brilliantly colored, as fancy dictated. I wish it were possible to visit all of you with slides and films and a bag full of samples and ideas. Some day, maybe, but in the meantime, let's look at some of these pictures.

That beautiful mosaic table in shades of blues and greens, with flecks of gold and bronze, was made by Alexander Bick of Milwaukee Downers College who also designed and cast the colorful inlaid jewelry creations. The manikin, complete with vital organs, was formed with Castoglas and fiberglass by the 8th grade science students at Archbold, Ohio. All done by hand, without heat or pressure. Isn't that remarkable work? And as you look at the photographs which so eloquently illustrate the versatility of Castolite resins, you can see why "serving industry, science, the arts and crafts" is more than a mere slogan.

"Unique and imaginative," that's what the leaders of the chemical industry have said time and again about our educational program. Well, our efforts have, at times, grown a shade beyond any immediate commercial interests. However, there are other compensations — like observing indifferent students taking a sudden interest in a subject. And so we shall continue to serve all schools with up-to-date methods and new resin formulas that are ideal for supplying the link between education and industry.

Fiberglass fabrics, honeycomb core, fillers, color pigments and other supplies may be ordered by the ounce or in gallon lots.

CASTOLITE CLASS PROJECT KIT
Cat. No. CS-1
$25.00

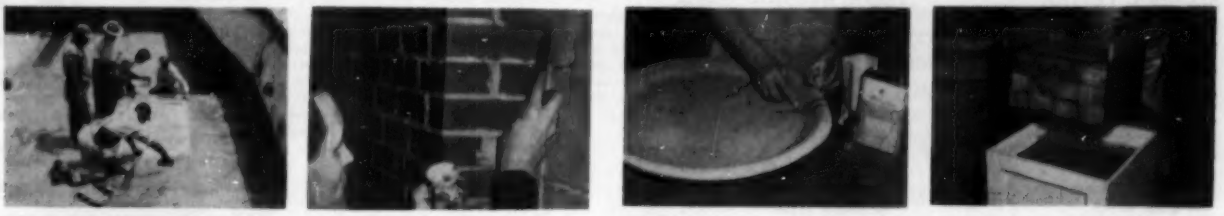
This Kit has been assembled with great care to equip you with the basic casting supplies for making several hundred specialty castings from small buttons and key tags to larger display castings for scientific and industrial embedments. Includes several dyes, phosphorescent pigments, pearl essence and pearl flakes. All of the standard metal and ceramic molds can be used over and over again.

Quick action and Castoglas saved hundreds of dollars at a labor and material cost of only $1.95, when break in main acid line threatened plant shut-down; not one minute was lost. A few cent's worth of Castoglas and fiber tape has saved this gooseneck. It's still good as new after 3 years.

Gutter patch — material cost: 5¢; time: 4 minutes. With Castoglas-impregnated fiberglass, automobile body work can be done quickly and at a fraction of former cost. Fiberglass patch extends life of fume-corroded exhaust funnel. Castoglas securely holds pipe in place; steel-hard resin won't chip.

Permanently leakproofing a hull with Castoglas-impregnated fiberglass adds strength and years of life to an old boat. Tough "glass" skin won't rust, corrode or crack. Good for new boats, too. "How to Make Old Boats New With Castoglas and Fiberglass" tells all.

Heavy machinery and excessive traffic cracked this concrete floor and corroded surface areas to which no patching material would adhere. "Glass putty" — Castoglas resin mixed with ground glass fiber — and a tile-hard coat of Castoglas Enamel did the job. No new cracks developed after several years of abuse.



We are fiberglassing a steel swimming pool to prevent corrosion. Looks very promising, but 9 months is too short a time for conclusive evaluation.

Cracks like these are hard to control. Alternate thawing and freezing has not affected this "glass putty" patch, now in its third winter.

This fine bird bath was too expensive to be discarded. In time, other cracks may develop but Castoglas resin repair will outlast concrete.

Castoglas Enamel converts wooden shipping crate into acidproof tank at a cost of only $2.25. Acid would ruin a metal tank in one day.

YOU CAN PATCH IT WITH Castoglas LIQUID PLASTICS

FIBERGLASS CLASS PROJECT KIT
Cat. No. GS-2
$25.00

In addition to 9 lbs. of Castoglas laminating resin (approx. 1 gallon), this Class Project Kit contains several yards of fiberglass fabric, glass tape, experimental quantities of mat and honeycomb. Five different pigments are also included and sufficient quantities of Thinner, Cleaner, fillers and other supplies needed to make a series of projects in which the entire class can participate.

Detailed instructions are furnished, all carefully developed by practical teachers who are using these materials in their own wood and metal shops. With these training aids, it is easy for you to create projects that cannot be made as quickly or as economically with any other materials.

The Class Project Kits described here are just the thing for introducing liquid plastic and fiberglass in your shop. Let the students start right in with you. Honestly, it's amazing how much they can and will contribute to this program when they are given a chance to work at something they are really interested in.

Authorized purchases are charged to your school. If you want to order on your own account (with cost shared by all students), your check with order will be helpful. But if you want more facts first, check and mail the coupon to:

School Dept. C-50

THE CASTOLITE COMPANY, Woodstock, Illinois

● Producers and Distributors of Casting, Laminating, Coating and Molding Resins — Serving Industry, Science, the Arts and Crafts.

THE CASTOLITE COMPANY – School Dept. C-50
Woodstock, Illinois

Gentlemen: Please send us the following kits and literature:

- ☐ Castolite Casting Class Project Kit, Cat. No. CS-1 $25.00
- ☐ Fiberglass Class Project Kit, Cat. No. GS-2 $25.00
- ☐ Castolite Casting Kit, Cat. No. CM-1 (not illustrated) $7.75
- ☐ Castoglas Fix-It Kit, Cat. No. GK-1 (not illustrated) $5.00
- ☐ "Fiberglass and Liquid Plastic in the School Shop" Free
- ☐ "How to Make Old Boats New With Fiberglass" Free
- ☐ "How to Build Fiberglass Boats" 25¢
- ☐ "How to Cast Castolite Liquid Plastic" 25¢
- ☐ "How to Patch with Fiberglass and Castoglas" Free

Name: .....

School: .....

School Address: .....

City: ..... State: .....

Automotive Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies, may be used by the students in the industrial arts and vocational education courses.

AIR COMPRESSOR
1. 3 to 4 cu. ft., with tank, piping, and motor
2. Small portable, 1 cu. ft., with motor

ALIGNING JIG — for connecting rods

ANVIL
1. No. 100 or No. 125
2. Rim

ARMATURE GROWLER AND TESTER

AXLE STANDS

BATTERY EQUIPMENT
1. Cell tester, panel type with discharge rack
2. Charger (15-battery size) with rack
3. Charger (6-battery size)
4. Gas stove (small)
5. Lead-burning torches, with gauges and piping
6. Plate racks

BENCH
1. Electric test, elaborate
2. Electric test, simple
3. Work, with vises
4. Work, portable with vise

BLOWTORCHES — 1-qt. size

BOOKCASE

BRAKE
1. Adjusting stand
2. Band-lining machine

BULLETIN BOARD

CABINETS
1. Wood or metal, for bolts and supplies
2. Wood or metal, for filing job sheets and correspondence

CHAIN HOIST — with overhead trolley and track

CHAIRS
1. Teacher's
2. For tables, or with tablet arms

CHALKBOARDS

CRANE — portable

CRANKSHAFT TRUING TOOL

CREEPERS

DESK — teacher's

DRILL
1. Breast
2. Hand
3. Electric portable, ½ in.
4. Electric portable, ¼ in.
5. Press, 21 in., with motor and chuck

DYNAMOMETER — electric

FORGE — with blower and tools

FURNACES — gas

GREASE DISPENSERS

GRINDER
1. Cylinder, with motor
2. 8 in., with motor
3. 12 in., with motor

JACKS
1. Lever, 1½-ton
2. Floor, roller

LATHE
1. 11 in. by 4 ft., with motor, chucks, and attachments
2. 16 in. by 6 ft., with motor, chucks, and attachments

PRESS
1. Arbor
2. 30 ton

SPRAY PAINTING OUTFIT

VALVE REFACING MACHINE

VULCANIZER
1. Electric steam for tube work
2. Small, hand

WELDING OUTFIT — with tanks, gauges, and cutting torch

WHEEL ALIGNMENT
1. Gauge
2. Test table

Automotive Shop — Small Tools

ALCOHOL TESTER

BATTERY
1. Cell tester, prod type
2. Cell tester, cadmium
3. Clips, large
4. Element pullers
5. Fillers
6. Funnels, glass
7. Hydrometer, acid
8. Knives
9. Post builders
10. Post drills
11. Post markers
12. Separator trimmer

BITS
1. Expansive
2. Ratchet brace
3. Wood, 5/16 to 1 in.

BOLT CUTTER — 24 and 36 in.

CALIPERS — 6 in. inside and outside

CANS
1. Oil, ½ pt.
2. 1 gal., gas, safety
3. 5 gal., gas, safety
4. 5 gal., kerosene
5. Waste

CHECKS — tool, 1000, blank

CHISELS
1. Cape, ⅜ and ½ in.
2. Cold, ⅜, ½, ¾, and 1 in.
3. Diamond point

COMBINATION SQUARES — 12 in.

COTTER-PIN EXTRACTOR

DIVIDERS — 6 and 10 in.

DRILL SETS
1. 1/32 to ½ in., by 64ths
2. ½ to 1¼ in., by 32nds

FILE CARDS

FILE HANDLES — assorted

FILES
1. Flat bastard, 6, 8, 10, and 12 in.
2. Half round, 6, 8, 10, and 12 in.
3. Mill, 6, 8, 10, and 12 in.
4. Round, 6, 8, 10, and 12 in.
5. Square, 8, 10, and 12 in.

FIRE EXTINGUISHERS — Pyrene and Acid

FIRST-AID CABINET AND SUPPLIES

FLOOR BRUSHES — 18 in.

FUNNELS — tin, assorted sizes

GAUGES
1. Air pressure
2. Center
3. Depth
4. Thread
5. Thickness

GLASS CUTTERS

GOGGLES

GREASE GUNS — plain and pressure type

HAMMERS
1. Ball peen, 4 oz.
2. Ball peen, 1¼ lb.
3. Ball peen, 2 lb.
4. Lead
5. Riveting
6. Sledge, No. 12

LADLE
1. 3-in. bowl
2. 6-in. bowl

LAMPS — extension, with reels

LEAD POT — gas

MAGNET CHARGER

METERS — volt and ammeter test

MICROMETERS
1. Outside, 0 to 1 in.
2. Outside, 2 to 3 in.
3. Outside, 3 to 4 in.
4. Inside, 1½ to 6 in.

MOLDS
1. Battery nut
2. Battery post
3. Battery strap
4. Burning stick
5. Lead hammer

OILSTONE

PIPE TAPS — ⅛, ¼, ⅜, and ½ in.

PLIERS
1. Combination, 6 in.
2. Flat nose
3. Roundnose

PULLERS
1. Bearing
2. Gear
3. Wheel, hub type

PUNCHES
1. Center
2. Taper pin
3. Blacksmith

PUTTY KNIVES

REAMER — spindle bolt

REAMER SETS
1. Piston pin, ½ to 1⅜ in.
2. Taper pin
3. Valve seat

SAWS
1. Hack, frames, 10 in., adjustable
2. Hack-saw blades, 18, 20, and 24 teeth
3. Hand

SCALES
1. Steel, 6 in., graduated 1/64 and 1/100 in.
2. Steel, 12 in., graduated 1/32 in.

SCRAPERS
1. Bearing
2. Carbon

SCREW DRIVERS
1. 6 and 12 in.
2. Small combination

SCREW EXTRACTORS

SCRIBERS

SNIPS — tin, 3 in. straight and 3 in. curved

SOLDERING COPPERS
1. Assorted
2. Electric
3. Handles

SPRING SPREADERS

STAMPS
1. Figures, 3/16 in.
2. Letters, 3/16 in.

TAP-AND-DIE SETS
1. Machine screw
2. N.F. ¼ to 1 in.
3. N.C. ¼ to 1 in.

TIRE TOOLS

TOOL KIT — metal box or canvas roll, empty

TWIST DRILLS — (extra sets) selected sizes

VALVE
1. Grinders (hand)
2. Spring lifters

WRENCHES
1. 8, 10, 12, and 18 in.
2. Ignition sets
3. Pipe, 10, 14, 16, and 18 in.
4. Rim socket
5. Socket sets, large assortment with case
6. Spark plug
7. Speed wrenches
8. Standard end sets, ¼ to ⅞ in., N.C. and N.F.
9. Valve-tappet wrenches

Automotive Shop — Materials and Supplies

ABRASIVE CLOTH AND PAPER — aluminum oxide and silicon carbide

ACETYLENE GAS — in drums, for welding

ACID

ALCOHOL

BABBITT

BEARING BLUE

BEARING COMPOUND
1. 600W
2. Penetrating

BOLTS
1. Machine, selected sizes
2. N.F. selected sizes
3. Stove, flat or round heads, selected sizes

BRAKE JUICE — ½-pt. cans

BRUSHES
1. Paint
2. Spark plug
3. Spoke
4. Steel
5. Varnish

CHAMOIS

(Continued on page 72A)

McKNIGHT SHOP BOOKS

Celebrating! 60 YEARS OF EXPANDING SERVICE TO EDUCATION . . . with ultra-modern new home now under construction

General Shop

BENCH WOODWORKING

PUBLICATION DATE January 3, 1955

By *Frykland and LaBorgo*

#1 You'll want this completely new text for beginning students above seventh grade.

- Covers fundamentals of hand woodworking
- Provides instruction on basic handtool operations
- 387 "show-how" drawings and pictures illustrate information topics, give details of techniques
- Plenty of new projects
- Valuable technical and related information.
- All about tools and how to use them, types of occupations, sources of wood, processing

NOW! FOR FIRST TIME — AVAILABLE IN BOTH BINDINGS
CLOTH BOUND, $3.00 PAPER BOUND, $1.25

METALWORK TECHNOLOGY AND PRACTICE

By *O. A. Ludwig*

PUBLICATION DATE August 25, 1955

#31 Don't fail to order this entirely new revision of the most complete general metalwork textbook ever published. Text describes tools, materials, and operations common to many metalworking occupations. Huge index with over 4,000 entries, completely cross-referenced. Hundreds of illustrations make this book useful and interesting for high school and junior high use. 400 pages. Cloth bound. $4.40

GENERAL PRINTING

By *Cleeton and Pitkin*

#7 Standard text for beginning students contains 10 new units. Numerous photographs explain printing procedures, equipment, layout, design, history, and occupational information. 200 pages. Cloth bound. $3.00

GENERAL SHOP ELECTRICITY

(Recently Revised)

By *Dragoo and Porter*

#8 Beginner's text in practical electricity. Includes 26 projects to demonstrate applications of electrical theory with explanations of how and why each works. Projects include radio construction and usable home appliances. Many illustrations. $1.25

GENERAL DRAFTING

By *Frykland and Kepler*

#15 Beginner's text presenting the fundamentals of drafting in 2 parts: (1) operations (manipulative), (2) information topics (things to be known). Problems presented with each unit. 430 illustrations. $1.25

Graphic

ARCHITECTURAL DRAFTING

NEW — 1954

By *J. Edgar Ray*

#60 One hundred and ninety-four sketches and views graphically present the principles and techniques of architectural drawing. These are correlated with working drawings, plans, and detail drawings. 256 pages. $4.80

MACHINE WOODWORKING

By *Robert E. Smith*

#2 Detailed instruction for operation and care of lathes, grinders, saws, jointers, planers, shapers, routers, mortising machines, and sanders. Two hundred twenty-four graphic illustrations show units and how to use them. Safety procedure stressed. 152 pages. $3.00

GENERAL SHOP METALWORK

By *Dragoo and Reed*

#30 Basic beginning text covers bench, sheet and art metal, ornamental metalwork. 104 pages. $1.25

GAS AND AC ARC WELDING AND CUTTING

By *R. E. Jennings*

#36 General text for beginners stresses common practices and safety measures. $1.25

FORGING AND WELDING

COMPLETELY REVISED, August 25, 1955

By *Robert E. Smith*

#37 Forging equipment, methods and operations; welding equipment and procedures. Illustrated. $1.25

MACHINING OF METAL

By *Robert E. Smith*

#33 Instruction on operation and care of machines. Cloth cover. $3.50

GENERAL ELECTRICITY

Revised 1954 Edition

By *E. W. Jones*

#13 Simple, direct text for general course in electricity for young people. Several practical shop projects. $1.25

APPLIED DRAWING AND DESIGN

By *Mattingly and Seagin*

#43 This beginning text includes many products and a wealth of related information. $2.20

TEACHING SUCCESSFULLY THE INDUSTRIAL ARTS AND VOCATIONAL SUBJECTS

By *G. Harold Silvius and Estelle H. Curry*

#55 Practical suggestions for successful shop teaching methods. 340 pages. $4.50

Other McKnight Books

- #26 **FINISHING MATERIALS AND METHODS** By *George A. Soderberg*, 320 pages. $4.00
- #3 **PROJECTS IN WOODWORK** By *Douglass and Roberts*, 120 projects. $3.25
- #4 **28 TABLE LAMP PROJECTS** By *H. A. Menke*, 80 pages. $2.50
- #39 **SHEET METAL WORK** By *Robert E. Smith*, 76 pages. $1.00
- #40 **BENCH METAL WORK** By *Robert E. Smith*, 72 pages. $1.00
- #41 **ETCHING, SPINNING, RAISING and TOOLING METAL** By *Robert E. Smith*, 88 pages. $1.25
- #66 **PRACTICAL METAL PROJECTS** By *M. J. Ruley*. $2.00
- #29 **PROJECTS IN GENERAL METALWORK** By *M. J. Ruley*, 80 pages. $2.00
- #38 **PATTERNMAKING and FOUNDING** By *Robert E. Smith*, 141 illustrations. $1.25
- #34 **ENGINE LATHE OPERATIONS** By *Baudek-Whipple*, 160 pages. $1.80
- #35 **APPLIED FUNDAMENTALS OF MACHINES** By *W. H. Cornetet*, 320 pages. $2.50
- #12 **PROJECTS IN ELECTRICITY** By *Merle D. Collins*, 80 pages. $1.20

THESE ARE ONLY SOME OF McKNIGHT'S PRACTICAL SHOP BOOKS

CLIP THIS

McKNIGHT & McKNIGHT
Dept. 305, Market & Center Sts., Bloomington, Illinois

Send me 1 2 3 4 7 8 12 13 15 26 29 30 31 33 34 35 36 37 38 39 40 41 43 55 60 66 (circle ones desired) for FREE 30 DAY TRIAL. I will either return books in 30 days and owe nothing, or send you $..... in full payment.

Name .....

School .....

City..... Zone.... State.....

(Continued from page 70A)

COIL-SPRING ASSORTMENT
COPPER TUBING
COTTER PINS — assorted sizes
CROCUS CLOTH
DISTILLED WATER
DRAIN COCKS
ELECTROLYTE
ENAMEL — AUTO PAINTING
GASKETS
1. Copper asbestos
2. Cork and felt
3. Flange
GASOLINE
GREASE — cup, cans
KEROSENE
KEYS, WHITNEY — assorted
LACQUER — colors
LEAD
LUBRICANT — transmission
NAILS AND BRADS
NUTS
1. N.F., castellated, square, hexagon, selected sizes and kinds
2. N.C., square and hexagon, selected sizes
3. Machine screw, selected sizes
4. Wing, selected sizes
OIL — Cylinder, light, medium, and heavy
OXYGEN — in drums for lead burning
PIG LEAD
PISTON-RING COMPRESSORS
RADIATOR HOSE
RIVETS — brake lining, 5/32, 1/2, and 3/4 in. long
SCREWS
1. F.H. or R.H., iron or brass, selected sizes and kinds
2. Cap and machine, iron or brass, selected sizes and kinds
SEALING COMPOUND
SHELLAC — 1/2-pt. cans
SHIM STOCK
SOAPSTONE
SOLDER — bar, wire, or self-fluxing wire
SOLDERING PASTE
SPELTER — for brazing
SPONGES — 1/2 lb.
STARTING CABLE
TACKS AND STAPLES — upholstery
TIRE
1. Carcass fabric
2. Cushion stock
3. Inner-tube repair stock
4. Patching cement
5. Patches
6. Putty
7. Tread stock
8. Vulcanizing
VALVE-GRINDING COMPOUND — coarse and fine
WASHERS
1. Lock, assorted sizes
2. Wrought iron
WASTE
WIRE — primary and secondary

THE *Nichols* TOOL ROOM MILLER

"the miller that uses its head!"

A valuable accessory is the Nichols Heavy-Duty Vertical Milling Attachment. Takes full 1½ H. P. up to 2000 R.P.M. (So precise, some shops use it for jig boring!)

CONDENSED SPECIFICATIONS

Table Working Surface	9½" x 50"
Longitudinal Travel	19"
Transverse Travel	7"
Vertical Travel—Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 2000 R. P. M.	
Weight	1250 lbs.

The unusual versatility and extra capacity of this model make it extremely useful for the tool room. Because it is equipped with the "rise-and-fall" spindle, it can perform not only conventional precision milling, but also facing boring, key seating, contour milling and other operations. Both longitudinal and transverse feed screws are fitted with hand wheels and extra-large adjustable micrometer dials with easy-to-read graduations. This model is especially useful because of its compactness, generous capacity and ability to handle a wide variety of work to close tolerances — to "tenths" when desired!

Write today for Nichols general catalog which describes the six models of Nichols Millers. A fascinating, color movie, "the Miller that Uses its Head" is available for free showing. May we reserve it for you?

ASTE SHOW, CHICAGO, BOOTH 315

MANUFACTURED BY W. H. NICHOLS COMPANY - WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS NICHOLS-MORRIS CORPORATION 76-5 Mamaroneck Ave., White Plains, New York

AUTOMOTIVE EQUIPMENT

(Continued from page 62A)

rent model automobiles, complete with shifting lever, wheel, arm, column, and shifting link arms (basic training element). Include power steering types

TRANSMISSIONS
1. Order conventional transmissions used on current model automobiles
2. Order automatic type transmissions used on current model automobiles

Furniture

The shop furniture should be in keeping with furniture used by other classes in other rooms of the school. Especially in the shop, it's wise to keep furniture painted, varnished, polished, and well cared for.

BENCHES — *see* section on Special Equipment and Testing Devices

BULLETIN BOARD

CABINET
1. Steel supply, 36" x 18" x 72" cabinet, double doors, locking. 4 shelves
2. First aid cabinet, 5" x 12" x 20" steel for first aid supplies, painted white

CHALK BOARD

DESK, TEACHER'S — 5 drawer

FILES — 4 drawer, legal size

FIRE EXTINGUISHER
Approved types according to local building and safety codes

SEATING
Provisions should be made for seating class: tablet arm seats are recommended

PROJECTOR
1. 16mm. sound motion picture projector
2. 35mm. comb. with 2" slide still projector

SCREEN
6' x 8' beaded screen, tripod or wall mtng.

ASSOCIATION NEWS

(Continued from page 6A)

Over eighty people attended the luncheon which was held in the school cafeteria.

Superintendent W. S. Hamilton of the Hickory schools in his welcoming address said: "Channel only the best students into industrial arts which for years has been a dumping place for the poor students."

"North Carolina is becoming more industrialized rather than agricultural and industrial-arts teachers hold in their hands the future of N. C."

COLOR DYNAMICS, purposefully used on walls and machines in the plants of Graflex, Inc., at Rochester, N. Y., improves efficiency, safety and morale of workmen who make the world's best-known high-speed cameras.

Pittsburgh COLOR DYNAMICS®

Helps Achieve Ultra-Accurate Workmanship in Graflex Plants

Tomorrow's shopmen must know how to use color to improve productive efficiency and morale!

MORE AND MORE educators are recognizing that better knowledge of the use of color is making an important contribution to greater productive efficiency and to the improved health and welfare of workers.

● **That's why** Pittsburgh's painting system of COLOR DYNAMICS is being included in courses on vocational training.

● **Tomorrow's shopmen** are being shown how the principles of COLOR DYNAMICS, when applied to buildings and machines, provide a more pleasing and cheerful environment. Eye-rest colors on walls and machine tools help workers to see their tasks better. Eye fatigue, so often the cause of lowered efficiency, is lessened. Morale-building colors on walls and ceilings promote cheerfulness and improve the mental attitude of employees. Safety colors on motorized equipment and traffic lanes warn of dangers and reduce the number of time-loss accidents.

● **Begin now** to teach your students the important principles of COLOR DYNAMICS. Better still, demonstrate the effectiveness of this painting method in a practical manner by applying it in the decoration of classrooms and equipment.

Engineered Color Study of Your Classrooms—FREE!

● Write today for a free booklet explaining how Pittsburgh's system of COLOR DYNAMICS can be put to work. Better still, we'll be glad to demonstrate the benefits of this modern painting method in your classroom. We'll provide an engineered color study for you without cost or obligation. Call the Pittsburgh Plate Glass Company branch nearest you and arrange to have a representative see you. Or mail this coupon.

Send For FREE Book!

Pittsburgh Plate Glass Co., Paint Div.
Department 1A-16, Pittsburgh 22, Pa.

☐ Please send me a free copy of your booklet "Color Dynamics."

☐ Please have your representative call for a Color Dynamics Survey without obligation on our part.

Name_____

Street_____

City_____

County_____ State_____

PITTSBURGH PAINTS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

In the business meeting it was decided to have the Project Fair which will be held in Greensboro, a two-day Fair instead of one.

Many small towns asked to have the meetings including the large annual Spring Fair. This is a very fine thing for the state industrial-arts teachers.

Officers of the Association are: president, David Rigsby; vice-president, Robert Leith; secretary-treasurer, Dr. Marshall Schmitt; executive, Thomas Haigwood; committeeman, John Jenkins.

♦ At the November 22, 1955, meeting of Epsilon Pi Tau, Alpha Rho Chapter, New York University, the following officers were elected to serve for the coming year: Joseph Duffy, president; Robert Ellis, vice-president; Jack Faber, secretary; and Gerald Sorensen, treasurer.

NEW JERSEY VOCATIONAL AND ARTS ASSOCIATION MEETING

The New Jersey Vocational and Arts Association will hold its 38th annual convention at the Berkeley-Carteret Hotel in Asbury Park, N. J., on March 15, 16, and 17.

Joseph E. Vargo, a representative of the Crow Electri-Craft Corporation, will speak and give a demonstration on "The Teaching of Beginning and Basic Electricity," on Friday, March 16, at 4:00 p.m., in the Coffee Room of the Berkeley-Carteret.

On Saturday, March 17, at 9:30 a.m., there will be a panel discussion on the "Do-It-Yourself Movement" and its implications on industrial-arts education. The program will be keynoted and led by Dr. Burl Osburn, chairman of the department of industrial-arts education, State Teachers College, Millersville, Pa.

The panel members will be a teacher educator, retired individual, tradesman, union representative, student, professional person, school administrator and industrial-arts teacher. This program will be held in the Crystal Terrace Room of the hotel.

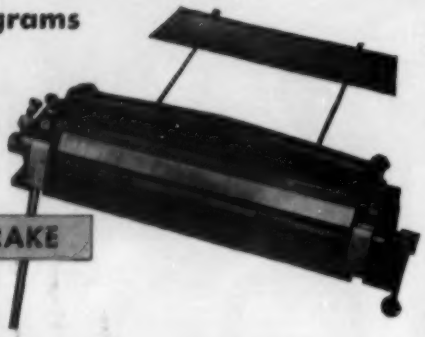
The executive committee authorized Sven M. Hedlund, secretary, to enroll the New Jersey Industrial Arts Association in the American Council of Industrial Arts Provincial and State Secretaries. This council operates as a part of the American Industrial Arts Association. The purpose of the council is to co-ordinate ideas originating with the many state and provincial organizations throughout the United States. The state organization secretaries will meet once a year at the annual convention of the American Industrial Arts Association.

♦ The new slate of officers elected by the Massachusetts Industrial Education Society are as follows: Leo V. Gittzus, Lexington, president; John Paltsits, Braintree, vice-president; Gerald Antonellis, Stoughton, secretary; and Arthur G. Sticklor, Natick, treasurer.

Members appointed to the executive board for the current year were: James J. Hammond, Fitchburg; Joseph Rains, Boston; Edwin L. Frye, Newtonville; Frank Carroll, Worcester; James Smith, Springfield; Joseph Slyva, Newton; Charles Plumb, Boston; Charles Avadanian, Malden; and Carl A. Olsen, Braintree — *Arthur G. Sticklor, Publicity Chairman.*

BERKROY 24" SHEET METAL TOOLS

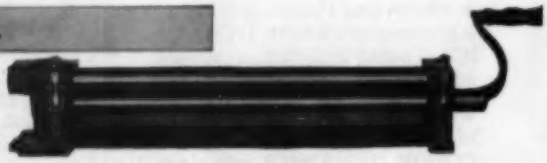
Enlarged Training Programs Possible With These Production Tools of Advanced Design



24" BOX AND PAN BRAKE

Turning a knob provides infinite adjustment to any angle from 0° to 135°. Forms any size box or pan from ½" to 24" by ¼" graduations. Makes intricate folds, reverse bends and radius bends on sheet metal up to 16 gauge and up to 24" wide. Bending leaf operates on Torrington Needle Bearings. Full 1" clearance between top fingers and anvil. Maximum 2½" box or pan depth permits deeper bends.

24" SLIP ROLL



Finger-tip controls on both ends of top roll permit quick adjustment for any material thickness of unit. Will accurately roll 24" widths in 20 gauge mild steel — heavier gauges in narrower widths. Removal of work is easily accomplished due to the spring loaded, hinged top roll. Heavy duty rolls 1½" diameter — distortion proof channel iron base, enclosed gears and oilite bearings are a few of many features.

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

For catalog information, write to
BERKROY PRODUCTS, INC.
2512 N. ONTARIO STREET • BURBANK, CALIFORNIA

Personal News

J. G. GROVE RETIRES

Professor J. G. Grove, for 35 years head of the Industrial Education Department at East Texas State Teachers College, Commerce, Tex., retired September 1, 1954. During the 35 years Professor Grove was very active as a conference leader, consultant, speaker, and was most influental in the early development of industrial arts in Texas and the Southwest in general, as much or more than any other man he determined the philosophy, objectives, and program of industrial arts in Texas. In all his work for the cause of industrial arts he ranks high in the esteem of his associates, all of whom regard him as a pioneer and an outstanding leader in the movement.

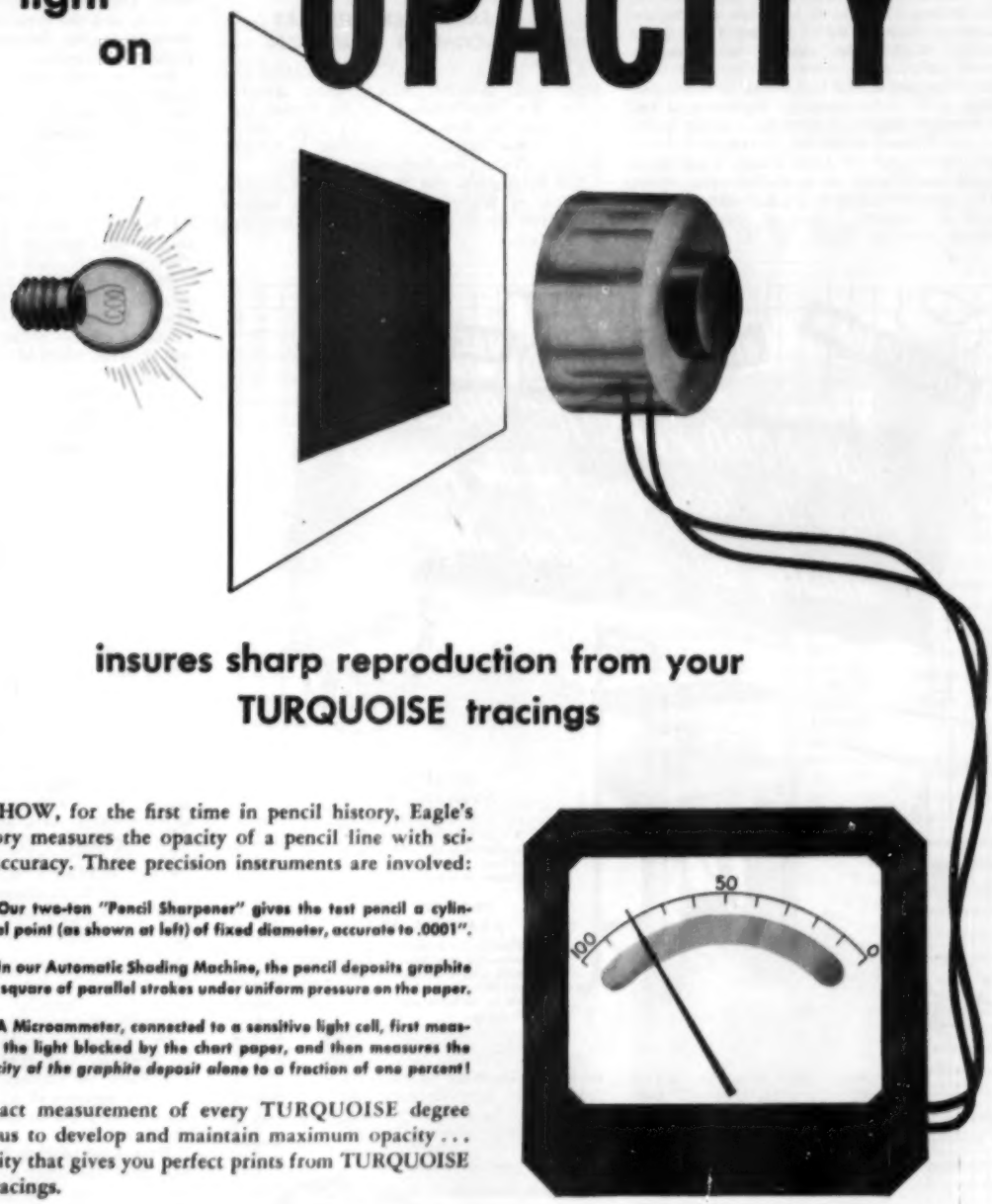
Mr. Grove was born August 13, 1888 in a two-room log cabin in the mountains of Tennessee about eight miles east of McMinnville in Blue Spring Cove. He went to a one teacher rural school until he was eighteen, at which time the family moved to McMinnville when his father, William Grove, was elected sheriff of the county. Upon finishing the McMinnville public high school in May, 1910, he taught in rural and village schools in Tennessee until 1913. He attended Middle Tennessee Normal School at Murfreesboro from 1913 to 1915 and was superintendent of schools in Tullanoma, Tenn., from 1915 to 1917.

From August, 1917, until March, 1919, Professor Grove served in the army and at the time of his discharge he had attained the rank of captain. Following his World War I experience he resumed his college work at George Peabody College at Nashville, Tenn., where he received the B.S. degree in August, 1919. He took his master's degree from the University of Wisconsin during 1922–23 where he studied with Professor Ira S. Griffith.

In the fall of 1919 Mr. Grove came to

(Continued on page 76A)

A new light on OPACITY



insures sharp reproduction from your TURQUOISE tracings

READ HOW, for the first time in pencil history, Eagle's laboratory measures the opacity of a pencil line with scientific accuracy. Three precision instruments are involved:

(1) Our two-ton "Pencil Sharpener" gives the test pencil a cylindrical point (as shown at left) of fixed diameter, accurate to .0001".

(2) In our Automatic Shading Machine, the pencil deposits graphite as a square of parallel strokes under uniform pressure on the paper.

(3) A Microammeter, connected to a sensitive light cell, first measures the light blocked by the chart paper, and then measures the *opacity of the graphite deposit alone* to a fraction of one percent!

Such exact measurement of every TURQUOISE degree enables us to develop and maintain maximum opacity . . . the quality that gives you perfect prints from TURQUOISE pencil tracings.

PROVE IT IN THE PRINT with a free TURQUOISE sample. Just write us, naming this magazine and the grade you prefer.

EAGLE

*"Chemi-Sealed" (Super Bonded)
*TURQUOISE *Drawing Pencils & Leads*
With 100% *"Electronic" Graphite

EAGLE PENCIL COMPANY • NEW YORK • LONDON • TORONTO • MEXICO • SYDNEY

PERSONAL NEWS

(Continued from page 73A)

East Texas State Teachers College as head of the Industrial Education Department and held that position until retirement September 1, 1954, ending 45 years of inspiring and highly influential teaching. While at East Texas State Teachers College he taught 34 12-month periods only taking time out for one nine months' session at the University of Wisconsin during 1922–23 to complete requirements for the master's degree. Under his careful guidance and diligent work the Industrial Education Department at East Texas State grew from a small wood shop and drafting room to its present modern brick building completed in 1950 at a cost of $160,000. The building contains 24,000 sq. ft. and houses classes and shops in woodwork, metalwork, crafts, drafting, electricity, and related subjects.

Mr. Grove was a member of numerous professional societies and associations, wrote magazine articles, and collaborated on state and national bulletins for industrial arts.

L. T. SMITH HONORED AT HOME-COMING LUNCHEON

L. T. Smith, head of the industrial-arts department, Western State College, Bowling Green, Ky., was honored by his former students and the Arts and Crafts Club with a home-coming luncheon in the Paul L. Garrett Student Center, on November 19, 1955.

The Invocation was given by E. H. Canon, registrar at Western. The welcoming address was given by E. Kelly Thompson, president at Western.

Mr. Smith is a graduate of Bradley University, Peoria, Ill., and a former instructor at Iowa State College, Ames, Iowa. When he came to Western State College, he developed an industrial-arts department, and served as football coach. During his first years he built a building to house the industrial-arts department. This was destroyed by fire on January 2, 1928, and the department was housed temporarily in the basement of the home-economics department.

For his thirty-five years of inspirational leadership to the college, state, and nation, Mr. Smith was presented with a sterling silver service set inscribed with "In recognition of your years of inspiring leadership from the boys November 11, 1955."

♦ Forest T. Selby, a veteran industrial-arts teacher of Charlotte, N. C., retired in June, 1954, after 45 years of active service.

Mr. Selby received his diploma in industrial arts in 1912 and his B.S. in education from Miami University, in 1915. He later attended extension courses at the University of Chicago, and received his A.M. in 1919 from Columbia University.

His teaching career covers work as a shop instructor; as assistant professor of industrial education, Miami University; as teacher trainer at North Carolina State College; city director of vocational education, Durham, N. C.; principal of Charlotte Technical High School, Charlotte, N. C.; and city director of industrial education, Charlotte.

He is a past-president of the Durham Teachers Association, the North Carolina Vocational Education Association; and the North Carolina Vocational Guidance Association. He has also held memberships in the Executive Committee, North Carolina Educational Association; the Legislative Committee, National Vocational Guidance Association; the North Carolina Education Association Board of Directors; and was southeastern correspondent of the Industrial Education Magazine for six years.

Mr. Selby has made numerous contributions to professional magazines, and is considered to be one of the charter subscribers to Industrial Arts and Vocational Education magazine.

♦ Dr. Benjamin B. Freud, emeritus professor and first chairman of the chemistry department at Illinois Institute of Technology, died December 12, 1955, at his home in Chicago.

A member of the faculty for 45 years, Dr. Freud served as dean of the evening division as well as chairman and professor in the chemistry department.

Dr. Freud, a native Chicagoan, received his bachelor and doctor's degrees from the University of Chicago. In 1917 he also received a bachelor of science degree in chemical engineering from Armour Institute, forerunner of Illinois Tech.

From 1941 to 1944 Dr. Freud was on active duty with the army as colonel, chemical warfare. He acted as representative with the Office of Civilian Defense.

Dr. Freud was a member of Phi Beta Kappa, Sigma Xi, the American Chemical society, American Institute of Chemical Engineers, and the American Association for the Advancement of Science.

He is survived by his wife, Mrs. Henrietta Zillman Freud, Chicago.

♦ Dr. C. Thomas Olivo has been appointed Chief, Bureau of Vocational Curriculum Development and Industrial Teacher Training in the State Education Department, University of the State of New York, succeeding Eugene D. Fink, who has retired.

Dr. Olivo was a visiting instructor in this department in the 1953 summer session.

STRETCH FORM
BLOW FORM
VACUUM FORM
DI-ACRO PLASTICS PRESS
brings the techniques of the plastics industry into the school shop
MATERIALS AVAILABLE AT LOW COST
A variety of colors are available in 18" x 24" sheets of both acrylic and styrene plastics in many thicknesses.
PROJECTS ARE AVAILABLE, TOO
Plastics for the School Shop —twelve new plastics projects—have been published to stimulate thinking in blow, vacuum and stretch forming.
Di-Acro Plastic Press No. 18 is a three way press that will professionally execute hundreds of new plastics projects. It stretch forms pre-heated plastics over student made wood or plaster plugs. It blow and vacuum forms by motor driven pump into easy-to-fashion molds. Handles sheets up to 18" x 18".
Di-Acro Plastic Press No. 1 stretch forms only, but can easily be converted to blow forming. Other features same as No. 18.
All Di-Acro products are backed by one year warranty
pronounced die-ack-ro
di-acro
PLEASE SEND
Plastics Press Literature
Plastics Price Sheets
Plastics for the School Shop
O'NEIL-IRWIN MFG. CO.
351 Eighth Ave. • Lake City, Minn.
Name
School
Address

♦ ROLAND H. SPAULDING, School of Education, New York University, New York City, spent the summer of 1955 in Honolulu, Hawaii, where he was director of an aviation education workshop at the University of Hawaii. The workshop was held during the period from June 22 through August 2, and was attended by public school teachers from the Territory of Hawaii.

♦ CARLTON E. BAUER of the Department of Vocational Education, New York University, New York City, received his doctor of philosophy degree in June, 1955, and has been appointed assistant professor of education. Dr. Bauer teaches drawing and design.

♦ BENJAMIN J. NOVAK, formerly head of the Science Department, Frankford High School, Philadelphia, Pa., assumed the duties of vice-principal of Frankford High School, beginning February 1, 1956.

♦ ROBERT L. OGLE, formerly of Rule High School, Knoxville, Tenn., is now employed as an instructor of metalworking at Memphis State College, Memphis, Tenn.

♦ GASTON LEBOIS is teaching ceramics, jewelry making, industrial-arts design and introduction to art at the State Teachers College, California, Pa.

He received his bachelor of science degree in 1951 at Pennsylvania State University, and his master's degree in 1955 from the same institution.

♦ DR. COOVER taught a course in shop management and layout at Pennsylvania State University last summer.

♦ DR. RICHARD W. SHACKELFORD, formerly at the University of Florida, has joined the staff of State Teachers College, California, Pa.

He teaches elementary and advanced woodwork and beginning mechanical drafting.

♦ JOHN R. SWEARINGEN teaches elementary and advanced machine-shop practice and mechanical drafting at State Teachers College, California, Pa.

♦ ANTHONY T. STAVASKI, in charge of the graphic-arts department at the California State Teachers College, California, Pa., was honored by the Pennsylvania Industrial Arts Association at the state convention held in October, 1955, at Hershey, Pa.

The "Outstanding Service Award in the Field of Industrial Arts Education" was presented to Mr. Stavaski by J. Philip Young, first president of the association.

♦ G. HAROLD SILVIUS has recently been appointed to serve a three-year term on the Advisory Council of the Ford Industrial Arts Awards Program by Henry Ford II. He will represent the state of Michigan.

♦ HERBERT L. MILES went to Ferris Institute at Midland, Mich., from Detroit, to teach supervisory techniques and related subjects in the Trade and Industry Division of Ferris Institute.

♦ ALF RASMUSSEN has moved to Lansing, Mich., to teach printing and woodwork at Walter French Junior High School.

♦ ALGER D. JOHNSON is now teaching industrial arts at Coopersville, Mich., having changed from Pennfield Junior High School, Battle Creek.

♦ JAMES L. TURNER has moved from Lancaster, N. Y., to Tallahassee, Fla., where he is ETE Co-ordinator at the Lively Technical School.

♦ BRUCE H. WELCH left South Haven, Mich., to teach auto mechanics at Waterford Township High School.

♦ HAROLD MATTHEWS of Jackson, Mich., ROBERT SLOCUM of Holland, and ARCHIE McLEAN of Traverse City, attended the Trade and Industrial Education Leadership Development Conference held at Colorado A. & M. College last August.

News Notes

MEXICAN EDUCATORS VISIT WAYNE UNIVERSITY

At the request of the United States Operations Commission in Mexico, a team of eight directors of secondary education of the Ministry of Education participated in a seminar at Wayne University during the last two weeks in November, 1955.

This educational project was under the sponsorship of the International Cooperation Administration, the agency in Washington which arranges and provides facilities for educational and other projects in international technical assistance programs.

The team was composed of the heads of the various departments of the Division of Secondary Education which has under its control direction of all secondary schools in the Republic of Mexico outside of the Federal District.

The seminar included trips to various industrial, cultural, and educational institutions in the Detroit area; visits to representative schools; a number of discussions led by educational leaders at the University, in the Detroit public school system, and in the Michigan Office of Vocational Education in Lansing. The objective of the seminar was to give the directors of secondary education the opportunity to observe school administration at the junior and senior high school levels with specific emphasis upon the whole problem of practical arts and vocational education. The

(Continued on page 86A)

new "package deals" on machinery for your shop!
Deal No. 1 @ $129.50 delivered
Sparton Model 24 Roller
Sparton Model 24 Box and Pan Brake
Di-Acro Shear No. 4
Di-Acro Notcher
Di-Acro Bender No. 2
Bender Accessory Package
Bender Stand
Machinery Stand
Reg. prices add up to $1427.00 plus freight.
Deal No. 2 @ $96.50 delivered
Sparton Model 24 Roller
Sparton Model 24 Box and Pan Brake
Di-Acro Shear No. 4
Di-Acro Bender No. 1A
Bender Accessory Package
Machinery Stand
Reg. prices add up to $1055.50 plus freight.
Three new "package deals" of Di-Acro Precision Machines are now offered to school shops only at a new low price! Brake and Roller are Spartan models, designed especially for schools. Bender, Notcher and Shear are industry proven. Benches of heavy gauge steel are designed for efficiency and long wear. Special prices include freight to your school.
Deal No. 3 @ $73.50 delivered
Sparton Model 24 Roller
Sparton Model 24 Box and Pan Brake
Di-Acro Bender No. 2
Bender Accessory Package
Bender Stand
Machinery Stand
Reg. prices add up to $832.00 plus freight.
All Di-Acro products re backed by one year's warranty.
pronounced die-ack-ro
di-acro
Tell me about
Package Deal No. 1
Package Deal No. 2
Package Deal No. 3
O'NEIL-IRWIN MFG. CO.
351 8th Ave., Lake City, Minn.
Name
School
Address

Ceramic Equipment, Tools, and Supplies

AUTOMATIC CONTROLS
1. Electronic temperature controls
2. Time controls

BATS
Plaster of Paris

BENCH WHIRLERS
1. Aluminum
2. Plastic
3. Setstone bats for whirlers

BOOKS

BRUSHES
1. Camel's hair
2. Squirrel
3. Fine red sable
4. Glaze

CELLOPHANE BAGS FOR STORING GREENWARE

CREAM-INK

CERAMIC DECALS

CERAMIC PENCILS

CHEMICALS
1. Feldspar
2. Flint
3. Gum arabic
4. Kaolin
5. Kiln patching cement
6. Kiln wash
7. Metallic oxides
8. Opax
9. Plaster of Paris
10. Plaster separator
11. Silicate of soda
12. Soda ash
13. White lead
14. Whiting
15. Zircopax

CLAY
1. Red modeling
2. White modeling
3. Fine white flower making clay
4. Porcelain

CONES — Pyrometric, 08-04 standard or junior; 020-018 standard or junior

CROCKS
1. 1-gal. size for glazing with covers
2. 5-gal. size for clay storage with covers
3. 10-gal. size for clay storage with covers

DAMP CABINET — old refrigerator or shop made

FETTLING KNIVES

GLAZES
1. Art
2. Crackle
3. Cold
4. Overglaze, various colors
5. Platinum
6. Under and overglaze mediums
7. Underglaze, various colors
8. Luster
9. Majolica
10. Matt

JARS — Pints and quart for storing glazes

KILN FURNITURE
1. Plate rack
2. Posts
3. Spurs
4. Standard stilts
5. Star stilts
6. Tile setters
7. Triangles

KILNS

KILN SHELVES
1. Full
2. Part

MODELING TOOLS
1. Boxwood
2. Fine-art plaster working
3. Lace tools
4. Moss decorator
5. Plaster
6. Sgraffito
7. Slip tracers
8. Wire loop

PITCHERS
1. Large — slip pouring
2. Small — glaze pouring

PLASTER-OF-PARIS MOLDS
1. Animals
2. Ash trays
3. Book ends
4. Candleholders
5. Candy dishes
6. Cigarette boxes
7. Dishes
8. Figurines
9. Flowerpots
10. Lamp bases
11. Mugs
12. Novelties
13. Planters
14. Salt and pepper shakers
15. Trays
16. Vases

POTTER'S WHEEL
1. Electric — constant speed, variable speed
2. Kick

SCALES

SIEVES OR STRAINERS — 30 mesh, 50 mesh, 80 mesh

SPONGES
1. Cellulose
2. Elephant ear

SPRAY BOOTH
1. Blower
2. Filters
3. Mask for spraying

SPRAY GUNS
1. Electric
2. Hand

TURNING TOOLS
1. Finishing rubbers
2. Rib
3. Right- and left-hand
4. Scrapers
5. Wire

WEDGING BOARD

Office Machines Repair, Equipment, Tools, and Supplies

L. G. WINES
Supervisor of Vocational Instruction
Department of Corrections
Chino, Calif.

The following lists for establishing an office machines repair program are minimum requirements. Additions may be necessary depending upon the extent to which training includes specialized office equipment.

The supply lists are minimum and include those items which should be stocked for general use. Specialized supplies required would depend upon the types and kinds of repairs being made.

Equipment

AIR COMPRESSOR — Pressure range 90 to 120 lbs.

AIR HOSE — 5/16 in. I.D. by 25 ft. with quick detachable connections

CABINET, SMALL PARTS — 10 drawer; 20 5/16 by 30 5/16 by 15 1/16 in.

DRILL PRESS — Complete with 1/2 in. Jacobs chuck, 10 in. by 10 in. working table

EXHAUST FAN — 1/4 h.p.-115 v., 60-cycle, single phase; fan diameter 16 in. — 6 blades, V belt drive, 2140 r.p.m., CFM 1945

GAUGE, SOLDERING

GRINDER — 6 in. H.D. Wheel — 6 in. by 3/4 in. face by 5/8 in. hole; 1/3 h.p., 115 v., single phase, 60 cycle, 3600 r.p.m. with guards, switch, cord tool rests, grinding wheels

LAMP, BENCH TYPE — Air cooled incandescent — 60 watt

LIGHT, VAPOR PROOF — 10 in. diameter, 30° adjustment, with conduit connection

LIGHTS, UNIVERSAL BENCH — With shade

MAGNETIZER-DEMAGNETIZER — 110 v., a.c.-d.c.

OVEN, ELECTRIC — 225° F @ 1000 watts; motor driven, forced air ventilation, 30 in. wide, 25 in. deep, 24 in. high, 110 v. a.c., single phase, with thermometer

PARTS, CLEANER — Jet 38 in. long, 21 in. wide, 34 1/2 in. high; 110 v., 60 cycle a.c., single phase

SCREWPLATE — Including 4-36, 6-32, 8-32, 10-24, 10-32, 12-24, 1/4-20

SPRAY, BOOTH — With ventilation; inside 3 by 4 ft. by 6 ft. 10 in. high

SPRAY, GUN — Complete with KS-503 suction feed cup attachment, with quick detachable connector

TRANSFORMER, AIR

TURNTABLE, BENCH — With brake

VISE — Swivel type, jaws 2 in. wide

Small Tools

ALIGNER
1. Royal side
2. Underwood side
3. Side
4. Royal type

BENDER
1. Link
2. Universal bar
3. Royal trip
4. Royal ribbon vibrator arm
5. L.C. smith sublever
6. Royal bottom rail
7. Underwood back space
8. Woodstock lower bar

BLOW TORCH — Alcohol, blow 1 1/4 by 7 1/4 in.

CLEANING, GUN (Air)

FILE
1. 6 in. warding
2. 4 in. warding
3. 6 in. segment
4. 6 by 1/4 in. pillar
5. 6 by 1/2 in. pillar
6. 6 by 1/2 in. course pillar
7. 6 in. half round
8. 6 in. square

HACKSAW — Adjustable 10 in. — 12 in. blades

HAMMER
1. Ball peen, 6 oz.
2. Brass, 8 oz.

MILL, UNDERWOOD PLATEN END

LOADER, ROYAL PINION BALL

OIL STONE — One side coarse, and the other fine

OIL STONE, TRIANGULAR

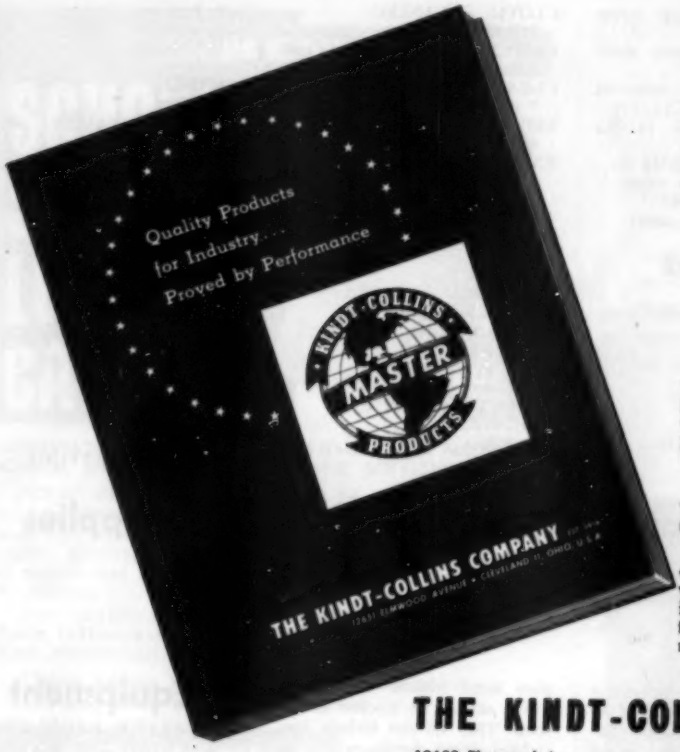
OIL CANS
1. Bench 8 oz.
2. Kit 1 oz.

PLIERS
1. 3 prong 7 in.
2. 9 prong 8 in.
3. Peening 7 in.
4. Wiring 7 in.
5. Long round prong 7 in.
6. Flat duck bill 7 in.
7. Parallel jaw 7 in.
8. Parallel jaw vise 8 in.
9. Chain nose side cutting 7 in.
10. Parallel jaw cutters 8 in.
11. Key lever peening 8 in.
12. Key ring 7 in.
13. Curved needle nose
14. Ribbon eyelet, male and female
15. Diagonal cutting
16. With type cutting jaws
17. With wire cutting jaws
18. Vise grip

PICK, ROYAL SEGMENT

PUNCH
1. Centering
2. Pin

(Continued on page 80A)



This New Catalog

WILL HELP YOU TO PURCHASE THE BEST IN SUPPLIES, EQUIPMENT, MACHINERY AND LUMBER FOR YOUR PATTERNMAKING, WOODWORKING OR MANUAL TRAINING CLASSES

If you need disc grinders, spindle sanders, white glue, pattern lumber, dust collectors, pattern plates, fillets, pattern letters, coatings, dowels, and many other school shop necessities, you will find them fully described in the new 1956 Kindt-Collins catalog!

Your copy will be mailed FREE if you will write us on your *school or official stationery*, stating your position.

This comprehensive supply and equipment catalog covering items for the patternmaking, woodworking and manual training classes should be in your files for easy, quick, efficient reference and ordering.

Write today!

THE KINDT-COLLINS COMPANY

12653 Elmwood Ave. • Cleveland 11, Ohio

Quality Products for Industry . . . Proved by Performance

HELPS YOU TEACH

johnson

quick-acting furnaces *help teach heat treating, case hardening, annealing, tempering of carbon steels—easy to operate, heat up fast to save time.*

NO. 181 BENCH FURNACE
Delivers up to 1800° F. without a blower. Heats soldering coppers up to 12 lbs. per pair. Two efficient burners. Patented curved hood. Has baffle plate, shut-off valve and pilot. Firebox 3¾" by 4½" by 5½". 13,000 BTU's per hr.

NO. 118 COMBINATION FURNACE
Above uses plus melting soft metals such as lead, babbitt, tin, zinc. Has 22-lb. capacity pot. Shelf in rear of firebox supports and protects soldering copper points. Johnson patented curved hood. Refractory-lined firebox 6¼" by 5" by 6½". 13,000 BTU's per hr.

johnson
If it burns gas look to Johnson Since 1891

WRITE TODAY FOR FREE CATALOG
Also information on factory reconditioning of your current Johnson Furnaces.

JOHNSON GAS APPLIANCE COMPANY
585 E Avenue N.W., Cedar Rapids, Iowa

CONNECTICUT

Model U322

Only $165.00

UNIVERSAL BENCH BRAKE

for school shops

A quality tool accurate and easy to operate. Versatility makes it ideal for training. Popular in commercial sheet metal shops for light production, box and pan work. Replaceable bronze bushings provide long machine life. Available in 3 and 4 ft. models, universal or plain. Write for Bulletin U 322I.

Rated Capacity: 1/8 flange on 22 gage mild steel, full brake length. Fingers of case hardened steel in widths of 2, 3 and 4 inches permit 3 inch box and pan depth. Other Prices of the Bench Series

4 ft. Universal,	$220.00
3 ft. Plain,	114.50
4 ft. Plain,	134.50

All prices F.O.B. Old Saybrook, Conn.

W. WHITNEY STUECK, INC.
Old Saybrook, Conn.

(Continued from page 78A)

REWINDER, RIBBON
ROLLER TYPE BAR — 8 in.
STRIPPER, PLATEN
SOCKETS, ROYAL
1. 7/32 in.
2. ¼ in.
3. 9/16 in.
4. 5/32 in.
5. 5/16 in.
SCREWDRIVER
1. Royal 7/32 in.
2. Split nut 10 in.
3. Split blade 12¾ in.

4. Shank	Blade Length	Overall Length
5/32 in.	2 in.	4½ in.
5/32 in.	3 in.	5¾ in.
5/32 in.	4 in.	7¼ in.
5/32 in.	10 in.	13⅞ in.
7/32 in.	4 in.	8½ in.
7/32 in.	7 in.	11¼ in.
5/16 in.	8 in.	12⅞ in.

SCRIBERS, SPRING HOOK
TOOL, KEYRING REMOVING
TWEEZERS — 6 in.
HAND VISE
WRENCH — Underwood electric impression control screw adjusting
1. Royal — Open end, ¼, 7/32 + 9/64, 5/16, 17/128, 13/32, 5/16 + 9/64, ⅜ in.
2. L. C. Smith — ⅛ and ¼ in. (Motion); escapement; ribbon friction adjustment
3. Remington — ¼ + ½ in., 3/8 + 7/32 in., 5/16 + 5/16 in., ¼ + ⅜ in., 15/64 + 5/16 in.
4. Escapement
5. Motion adjustment nut
6. Segment shift stop screw nut
7. Margin release lever shaft stop screw
8. Ribbon vibrator universal bar
9. Woodstock, ⅛, ¼, ⅜, 9/16 in.
10. Toggle 5/16, ¼, 7/32, ⅓ in.
11. Box — ¼ + 5/16 in. offset
12. Carriage rail screw
13. Universal bar nut upper

Supplies

BRUSHES
1. Tapered wire handle
2. Large cleaning
3. Enamel
4. Oil
5. Type cleaning
6. Benzine
7. Transfer cement
BUFFING COMPOUND — 2 lb. cans
CLOTH, CLEANING-POLISHING
CEMENT, TRANSFER — 4 and 8 oz. cans
CLEANER, TYPE — 2 oz. — 7 oz. cans
EMERY CLOTH — Fine, medium, and coarse
ENAMEL, WRINKLE
1. Black
2. Grey
3. Brown
HANDLE, FILE
1. Large
2. Small
KIT, DECALCOMANIA
LACQUER, SPRAYING
1. Black gloss
2. Black dull
3. Grey, brown, green
4. Clear
LACQUER STICK, ENGRAVERS
1. White
2. Black
3. Red
4. Blue
5. Yellow
6. Green
7. Gold
8. Silver
MARKING CRAYON
OIL
1. Light typewriter
2. Non fluid ball bearing
POLISH, CLEANER — 8 oz. cans
PADS, TYPEWRITER
1. Wool felt
2. Sponge rubber
PASTE, SOLDERING
REDUCER, ENAMEL
REMOVER, RUST & TARNISH — 8 oz. cans, pts., qts.
STEEL WOOL
SOLDER
1. Acid core
2. Rosin core
THINNER, SPRAYING

Refrigeration Equipment, Tools, and Supplies

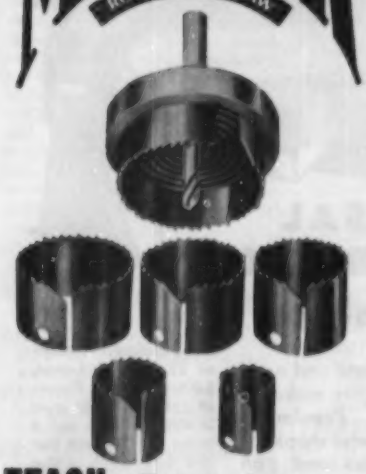
L. G. WINES
Supervisor of Vocational Instruction
Department of Corrections
Chino, Calif.

These lists for establishing a refrigeration program include all basic items. Individual instructors will likely devise special units and construct these units as necessary to augment standard equipment and small tools. Supplies listed include those items which should be stocked in the shop. They do not include specialized items necessary during the repair of specific refrigeration units.

Equipment

ACETYLENE REGULATOR, WELDING — 30 lb., 400 lb. capacity
ANALYZER, HERMETIC
(Continued on page 83A)

The ORIGINAL SAW for Every Purpose
MISENER ROTARY HACK SAW



TEACH efficient, low-cost Modern **HOLE-CUTTING** in Wood, Sheet Metals, Castings, Plastics, Wallboard, Tile, and other materials with versatile —
"HOLE-Master"
MULTI-BLADE HOLE SAW
ORIGINATED BY MISENER

HOLE SAWS
5/8" TO 15" DIA.

Illustrated at left is a MISENER "HOLE-Master" Hole Saw. This complete line of Multi-Blade Hole Saws includes tools with sets of 3, 6, 7, 9, and 11 blades in graduated dia. sizes. The ideal tools for teaching hole-cutting.

Send for —
FREE CATALOG
of Single and Multi-Blade Hole Saws.

MISENER MFG. CO., INC.
Dept. 10
202-8 WALTON STREET
SYRACUSE, NEW YORK

Now Available to School Shops the Ideal Item for Your
Woodworking Projects

1 **Pattern Kits:** 25 attractive patterns to make, each complete in a kit including pattern, hardware and 5/16" dressed cherry lumber necessary to make the pattern. Student must still do all the work but eliminates waste and buying of regular lumber. These are projects the woodworker will be proud to make and the parents pleased to own.

2 **Packaged Hardwoods:** Available in Butternut, Cherry, Walnut and White Oak, 5/16" dressed lumber 4" thru 8" wide, cut to 30" lengths, 10' to a carton, packed 5 cartons in a master carton. Can also be used with patterns available for pattern kits. Send for complete illustrated catalog with prices.

3 **Regular lumber dressed to your requirements:** Over 40 woods to select from in all thicknesses.

Send for complete catalog and price list.

VENEER LUMBER & PLYWOOD COMPANY
2637 S. Throop Street — Chicago 8, Illinois

NEW 1956

SCHOOL SHOP LUMBER CATALOG

AMERICA'S FINEST HARDWOOD LUMBER FOR MODERN SCHOOL SHOPS . . . KILN-DRIED! SOFT-TEXTURED!

NEW! FREE! Catalog features 18 species of woods used by School Shops, with illustrations and descriptive text . . . Special items such as bench tops, drawing boards, dowels, turning squares, plywoods . . . Delivered prices east of Mississippi and f.o.b. prices west of Mississippi.

Our lumber is properly kiln-dried — correct as to grade, texture and dryness. Works easier, works better. More economical!

Write address below for your FREE copy of new Catalog 56-S—today! Sent postpaid.

HARDWOOD CORPORATION OF AMERICA

EDUCATIONAL LUMBER DIVISION
P. O. Box 1091
ASHEVILLE, N. C.

"NONE BETTER"

REMEMBER THE NAME . . . Rubyfluid

the easy-to-use Soldering Flux for neat strong unions.

Use Rubyfluid Flux — liquid or paste — to get neat, strong unions speedily and easily. Rubyfluid is a special fast acting formula, wets out freely, is free from harmful and objectional fumes, economical to use. Try it — send $1 for special offer — 1 pt. liquid, ½ lb. paste flux and helpful booklet.

For Stainless Steel use *Ruby's Stainless Steel Flux*, perfected for that metal.

RUBY CHEMICAL CO.
77 C. McDowell Street Columbus 8, Ohio

Rubyfluid

Alcoa's fascinating new teaching aids tell story of aluminum production

Write for them . . . they're free

Integrated 15 x 21-in charts plus kit of exhibits tell complex story of aluminum production in simple, stimulating fashion. Available one to a high school for use in chemistry classes. Supplement these materials with booklets and with showings of Alcoa motion pictures described in free catalog. Write ALUMINUM COMPANY OF AMERICA, 802-C Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

Aluminum Company of America
802-C Alcoa Bldg.
Pittsburgh 19, Pa.

Ask for this free catalog of booklets and films.

☐ Please send new Alcoa® Aluminum teaching kit.

☐ Also send free catalog of motion pictures and booklets.

Teacher's name _____

High school _____

Street address _____

Post office and state _____

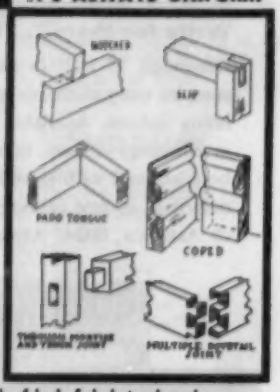
THE ALCOA HOUR • Television's Finest Live Drama • Alternate Sunday Evenings

SEALS THEM ALL — PERMANENTLY

ROGERS

IT'S CLEARER
IT'S STRONGER
IT'S ALWAYS UNIFORM

3,885 LBS.
ACTUAL SHEARING STRENGTH
PER SQUARE INCH



NO MATTER WHAT THE JOINT IT'S BOUND FIRM WITH ROGERS . . . and Rogers will Never Discolor Wood Materials. The joints shown here are only 6 of the 24 Typical Joints shown in Rogers Book of Woodworking Notes which you can have FREE.

It's full of helpful data, handy as a teaching aid. Send for Your Copy and Rogers Free Project Plans, TODAY!

Rogers Glue is handy in Leather Crafts, Print Shops and other manual arts classes, too.

ROGERS
the best LIQUID FISH GLUE
GLOUCESTER MASS

Start Your Students *RIGHT!*

Use books based on practical shop experience . . . books that have been chosen as standard texts by leading trade and technical schools . . . books your students will be able to use after graduation as reliable references.

MACHINE SHOP TRAINING COURSE

Hundreds of leading schools and shop training courses use this as their basic text. The two volumes contain 1124 pages of questions and answers, carefully selected to deal with the most important elements of machine shop practice. Packed with useful facts, shop rules and general data, and accompanied by drawings and photographs that make every subject clear.

Two volumes, $9.00
In Canada or overseas, $10.50

MACHINERY'S HANDBOOK

For over 40 years the outstanding authority on every phase of shop practice. A "must" for your reference library and a book that every student should own if he hopes to hold a responsible job in any metalworking industry. Contains 1911 pages of mathematical and mechanical tables, rules, formulas and general data — the kind of information that is needed daily by students, as well as shop men, engineers and designers.

15th Edition, Thumb Indexed, $9.00
In Canada or overseas, $10.00

Send school purchase order for examination copies of these books under our Five-Day Free Inspection Plan. Okay payment only after you have seen for yourself how they can help you and your students.

The Industrial Press
93 Worth Street New York 13, N. Y.

METALS		EQUIPMENT • SUPPLIES
ALUMINUM	**WE CARRY IN STOCK**	BENCHES
BRASS		ELECTRICAL SUPPLIES
BRONZE		FINISHING MATERIAL
COPPER		HAND TOOLS
LEAD		HARDWARE
NICKEL SILVER		MACHINE TOOLS
PEWTER		METALCRAFT TOOLS
STAINLESS STEEL		METALWORKING TOOLS
STEEL		PORTABLE ELECTRIC TOOLS
STERLING SILVER		PRECISION TOOLS
ZINC		SHEET METAL EQUIPMENT
ZAMAC		WELDING EQUIPMENT

All metals, tools, hardware, and equipment for the School Shop. Check our prices and compare our service.

Our 1956-57 catalog will be ready in March—get your name on our mailing list today!

PATTERSON BROTHERS
15 PARK ROW NEW YORK 38, N.Y.
YOUR MOST DEPENDABLE SOURCE SINCE 1848

NEW ENLARGED 1956

PLASTICS CATALOG

Now Ready for Teachers of Industrial Arts

BRINGS YOU ONE OF AMERICA'S FINEST SELECTIONS OF PLASTICS AND CRAFT SUPPLIES, AND FEATURES EVERYTHING YOU NEED FOR INTERNAL CARVING.

Send for FREE copy today! Contains hundreds of items — fully illustrated. Gives school discounts on all the plastics, tools, supplies and equipment you need for shop projects in plastics.

NEW ITEMS — offered for the first time in our 1956 edition: Castolite Liquid Plastic; Screwdriver Handle Stock; Hotpack Electric Strip Heaters and Ovens, and others.

FREE
INTERNAL CARVING INSTRUCTION SHEETS
for Distribution to Students

Describes basic techniques in carving, dyeing and filling. Simply make request on your school letterhead, stating quantity you need, and they will be mailed without charge.

- PLASTIC SHAPES AND ACCESSORIES
- FINDINGS • SHEETS
- TUBING • RODS
- SALVAGE MATERIAL
- MANUALS • DRILLS
- TOOLS
- READY-TO-CARVE GIFT ITEMS

D. W. COPE PLASTICS Dept. N
11640 Bellefontaine Road St. Louis 15, Mo.

(Continued from page 80A)

BENCHES
1. Soldering
2. Service and assembly

CHUCK, ENGINE LATHE
1. 5 in. — 3 jaw universal
2. 7½ in. — 4 jaw independent

CUTTER, PIPE — Capacity ⅛ to 2 in.

DOG, ENGINE LATHE — ½ to 4 in.

DRILL PRESS — Floor type, No. 2 Morse Taper-Jacobs chuck, capacity ¾ in.

DRILL
1. ¼ in. HD 7¾ in. overall
2. Morse straight shank HS set 1/16 to ½ in. by 64ths
3. Morse straight shank HS set A to Z sizes
4. Morse straight shank HS set Nos. 1 to 70, with block

EXTRACTOR — Bearing No. 1

FURNACE, SOLDERING — 14 in. long, 13,000 BTU, fire pot opening 4½ by 3 in.

GRINDER — 115 v., single phase, 60 cycle, 10 by 1 by ¾ in. wheels, 1800 r.p.m.

GROWLER, ELECTRIC
1. Range 2 to 7 in., face 2¼ in., 110 v., 60 cycle
2. Range 2 in. up, face 4 in.

IRON, ELECTRIC SOLDERING — 300 watt, 110 v., a.c.-d.c., 14½ in. long, ⅞ in. tip

OHMMETER — Range .5 Ohm — 50,000 Ohm

OPERATION RECORDER — a.c. & d.c. up to 60 cycles, voltage range 120–250 volt

OVEN, ELECTRIC — 225° F. at 1000 watts, motor driven-forced air ventilation, 30 in. wide, 25 in. deep, 24 in. high, 110 a.c. single phase, with thermometer

OXYGEN REGULATOR, WELDING — 100 to 3000 lb. capacity, maximum delivery pressure, 50 lb.

PRESS, ARBOR — 1 ton capacity-Ram, 1 by 1 by 7 in., with slotted plate, single leverage

PUMP — Blower-vacuum, air cooled, 4.3 cu. ft. per minute. Pipe outlet-inlet ½ in., maximum pressure intermittent duty, 25 lb. maximum vacuum, intermittent duty 28.5 in., 115 v., a.c. 60 cycle, single phase, ⅓ h.p. motor

REAMER, PIPE — Capacity ⅛ to 2 in., HS cutter

SCREW PLATE — Including NC-NF standards

STARTER AND ANALYZER — Capacity up to ⅓ h.p.

TEMPERATURE RECORDER — 20° F. to + 130° F. capacity, complete with charts

TESTER — Field coil, 110–220 v., 60 cycle

TESTER — Thermostatic control

THREADER — Ratchet pipe, capacity ⅛ to 1¼ in.

TOOL HOLDER
1. Engine lathe, straight shank, ½ by 1½ in.
2. Engine lathe, right hand shank, ½ by 1¼ in.
3. Engine lathe, left hand shank, ½ by 1¼ in.

TRUCK, APPLIANCE — Complete 2 wheel type with 15 ft. strap and ratchet

UNDERCUTTER — Mica, 110 v., a.c. motor

VISE — Combination pipe and machinist 4½ in. jaws, pipe capacity ⅛ to 3½ in.

WELDING OUTFIT — Any standard make with No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 11 tips, hose and cutting attachments

BENDER, TUBE
1. External, ¼, 5/16, ⅜, 7/16, ½, and ⅝ in.
2. Internal, ⅜, ½, and ⅝ in.
3. Hand tube, mechanical, 3/16, ¼, 5/16, ⅜, ½, ⅝, and ¾ in.

BRUSHES, FITTING — ¼, ⅜, ½, ⅝, ⅞, 1⅛, 1¾, 1⅝, and 2⅛ in. O.D. tubes

CHARGING LINE
1. Jumper end, 24, 30, and 36 in.
2. Quick coupler end, 24, and 36 in.

CLEANER, TUBE END — ½, ⅝, ⅞, and 1⅛ in. O.D. tubes

CUTTER, TUBE — ⅛ to 1¼ in., ⅞ to 2¼ in.

DETECTOR, HALIDADE LEAK

DRILLS, TWIST — High speed 1/64 to ½ in.

FLARING TOOL — Yoke and die, 5/16 to ½ in. tubing, ¼ to ⅝ in. tubing, ¾ to 1 in. tubing

GAUGES
1. Ammonia, 30 in., 150 lb., 30 in., 300 lb.
2. Retard, 30 in., 5 lb. retard to 200 lb.
3. Compound, 30 in., 150 lb. with freon 12, 30 in., 60 lb. with: freon 12, sulphur dioxide, 0 to 300 lb., methyl chloride, carrene

GAUGE TESTER — ⅛ in. pipe threads

GOGGLES
1. Welding 2. Grinding

GUNS
1. Air
2. Cleaning

HAMMERS — Ball peen, 2 oz., 8 oz., ¾ lb., and 1 lb.

LIGHTER, TORCH — Friction type

OILER
1. Pistol, 6 oz., 13 in. spout
2. Pump, 1 pt., 15 in. spout

PINCH-OFF — ¼, 5/16, ⅜, and ½ in.

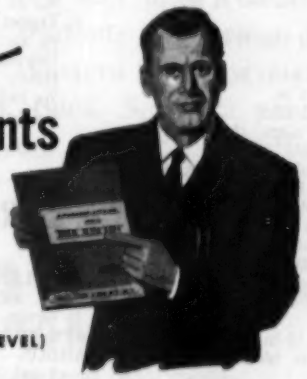
PLIERS
1. Side cutting, 5 and 6 in.

(Continued on next page)

Send for

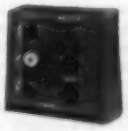
"Electrical Requirements for High School Electric Shops"

(INDUSTRIAL ARTS LEVEL)



You should have Booklet No. 205 . . . *especially* if you are planning a new shop or re-vamping your present one. This booklet gives valuable suggestions; offers a shop layout plan and lists fundamental requirements.

SAFE, TIMESAVING, UP-TO-THE-MINUTE EQUIPMENT



SERVICE UNIT

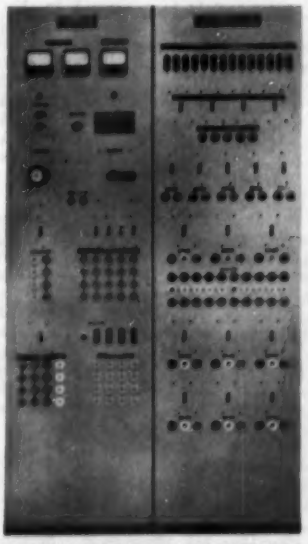
Typical bench unit for 2- or 3-wire variable service, 120V a-c and continuity test circuit. Single or double faced. Many other types.

CONNECTOR CORDS

Other types furnished to meet requirements.

MOTOR GENERATOR

A typical machine for furnishing 125V d-c. Furnished in any size required.



DISTRIBUTION SWITCHBOARD

This controls and distributes all the various a-c and d-c currents required for any work in the Electric Shop.

Since 1884

SEND TODAY STANDARD TO THIS ADDRESS!

The STANDARD ELECTRIC TIME CO.

127 Logan Street • Springfield 2, Massachusetts

(Continued from previous page)

2. Diagonal cutting, 7 in.
3. Long nose, 6 in.
4. Thin nose, 6 in.
5. Pump, 5 slip adjustment
6. Eyelet, and grommet
7. Needle nose, 6 in.
8. Bent nose, 6 in.

PULLER
1. Wheel, 2 arm, 3 arm
2. Fly wheel, chain type
3. Seal ring
4. Oil ring

PUMP, TEMPERATURE AND PRESSURE — 30 lb. P., and 28 lb. vacuum

PUNCHES — Hollow. ¼, 5/16, ⅜, 7/16, ½, and ⅝ in.

REAMER, INNER-OUTER — 7/16 to 1½ in.
3/32 in. 5/64 in. 5/16 in.

REFACERS, SAE — Capacity ¼, 5/16, ⅜, ½, and ⅝ in.

SAWS
1. Hole, ⅞, 1⅛, 1⅜, 1¾, and 2¼ in.
2. Hack, 8 to 12 in.
3. Utility, 6 in.

SCREWDRIVERS
1. ¼ in. blade thickness, 2, and 3 in.
2. 5/16 in. blade thickness, 1½, 3, 4, and 6 in.
3. ¼ in. blade thickness, 2, 4, 6, and 8 in.
4. 5/16 in. blade thickness, 8 in.
5. ⅜ in. blade thickness, 6 in., and 8 in.
6. Phillips, Nos. 2 to 4, and 5 to 9
7. Square, ¼ in. blade by 3 5/16 in., 5/16 in. blade by 3 5/16 in.

SNIPS
1. Straight 7, 10, and 12 in.
2. Circular 7, 10, and 12 in.

SOCKETS
1. Packing gland, ¼ in. drive

Depth	Width	Diameter Inside
5/32 in.	⅛ in.	21/64 in.
⅛ in.	⅛ in.	29/64 in.
5/32 in.	5/64 in.	5/16 in.
5/32 in.	7/64 in.	5/16 in.
5/32 in.	9/64 in.	11/32 in.
5/32 in.	⅛ in.	21/64 in.

2. Valve packing nut, oval opening ½ by ⅜ in.
3. Deep and standard — midget, ¼ in. drive, 5/16, 7/32, ¼, 9/32, 5/16, 11/32, ⅜, 7/16, and ½ in., including extensions, handles, universals, and ratchet plugs
   Ferret — ⅜ in. drive, ⅜, 7/16, ½, 17/32, 9/16, 19/32, ⅝, 11/16, ¾, 13/16, and ⅞ in. including extensions, handles, universals, and ratchet plugs
   Master — ½ in. drive, double hexagon, ⅜, 7/16, ½, 9/16, 19/32, ⅝, 11/16, ¾, 29/32, 15/16, ⅞, 15/16, 29/32, 1 1/16, 1⅛, 1 1/16, and 1¼ in. including extensions, handles and universals
   Heavy duty — ¾ in. drive, 1 1/16, 1⅛, 1¼, 1⅜, 1 7/16, 1½, 1⅝, 1¾, 1 13/16, and 1⅞ in. including handles and extensions
4. Valve stem — 5/16, 7/32, ¼, 5/16, and ⅜ in., ¼ by 7/16 in., ¼ by 7/32 in.

SWEDGE TOOLS — ¼, 5/16, ⅜, ½, ⅝, and ¾ in.

TACKER, GASKET

TESTERS
1. Control
2. Hermetic
3. Sling psychrometer
4. Thermometer — wall, pocket, remote dial thermometer
5. Moisture indicator — freon and methyl
6. Circuit, 90 v., d.c., 60 v., a.c., 500 v. a.c./d.c.

VALVE KIT — Service set for hermetically sealed units

VISE SAWING — 3/16 to 4 in. capacity

VOLTMETER — 65 volts, 660 volts, a.c. and d.c.

WRENCHES — Open end
1. Ignition type, 7/32 to 15/64 in., ¼ to 9/32 in., 17/64 to 19/64 in., 5/16 to 11/32 in., and ⅓ to 7/16 in.
2. Short open end, 5/16 to 7/32 in., ¼ to 5/16 in., 5/16 to 11/32 in., ⅜ to 7/16 in., and ½ to 9/16 in.
3. Tappet type, 7/16 to ½ in., ½ to 9/16 in., and ⅝ to 11/16 in.
4. Heavy duty, ⅜ to 7/16 in., 7/16 to ½ in., ½ to 9/16 in., 9/16 to ⅝ in., 19/32 to 11/16 in., ⅝ to 11/16 in., ⅝ to 1 1/16 in., ¾ to 7/8 in., 25/32 to 13/16 in., and 15/16 to 1 in.

WRENCHES — Box
1. Double Broached, ⅜ in. to 7/16 in., ½ to 9/16 in., 19/32 to 11/16 in., ⅝ to ¾ in., 25/32 to 13/16 in., ⅞ to 15/16 in., 1 to 1 1/16 in., 1 1/16 to 1¼ in.
2. Double Hex., 9/16 to ⅝ in., ⅝ to 7/16 in., 7/16 to ½ in., ½ to 9/16 in., 9/16 to ⅝ in., ⅝ to ¾ in., 1 1/16 to 1 3/16 in.
3. Half Moon, 7/16 to ½ in., 9/16 to ⅝ in., ⅝ to ¾ in.
4. Vise grip, 7 and 10 in.
5. Welding tank
6. Pipe, 6, 8, 10, 14, 18, and 24 in.
7. Flare nut, ¼ by 1 in., ⅜ by 1¼ in.
8. Refrigerator ratchet, reversible or non-reversible ½ in., 5/16, and ¼ in.
9. Adjustable 4, 6, 8, 10, 12, 18, and 24 in.
   Bristol, No. 4 to ½ in.
   Allen, 5/16 to ½ in.

Refrigeration — Supplies

ACETYLENE

BELTS, VEE — Variety of sizes to service refrigeration units

CAPS, PLUG

CARBON TETRACHLORIDE — 1 gal. to 5 gal.

CLOTH, EMERY — 50 yd. rolls 1 in. No. 80 coarse, No. 100 medium, No. 150 fine

COMPOUND, LAPPING — 320 grit — 500 grit

CORD, RUBBER COVERED
1. 2 conductor
2. 3 conductor

DEHYDRANT — 1 oz. to 1 pt. containers

FILLERS, PLASTIC

FITTINGS
1. Couplers, compression, female ¼ in. SAE
2. Compression nut, tube size: .078–.086 in. O.D., .086 to .096 in. O.D., .096 to 109 in. O.D., .110 to .118 in. O.D.
3. Capillary tube, Male SAE, ¼, 5/16, ⅜, ½, ⅝ in.
4. Ammonia
   90° elbows, 2000 lb. working pressure: ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, and 2½ in.
   Tees, 2000 lb. working pressure: ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, and 2½ in.
   Couplings, 3000 lb. working pressure, ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, and 2½ in.
   Reducing couplings, ¼ by ⅛ in., ⅜ by ¼ in., ½ by ⅜ in., ¾ by ½ in., 1 by ¾ in., 1¼ by 1 in., 1½ by 1¼ in., 2 by 1½ in.
   Straight flange unions, oval: ⅜, ½, ¾, and 1 in., square: 1¼, 1½, and 2 in.
   Steel tongue and groove: ¼, ⅜, ½, and ¾ in.
   Flanged adaptors, male I.P.S., ¼ by 1½ in., ¼ by 1⅝ in., ¼ by 1¾ in., ¼ by 1⅞ in., ¼ by 2 in.
   Flanged adaptors, female I.P.S., ¼ by 1½ in., ¼ by 1⅝ in., ¼ by 1¾ in., ¼ by 1⅞ in., ¼ by 2 in.
5. Refrigerant drum adaptors, ¼ in. FPT by ¼ in. flare, ¾ in. FPT by ⅜ in. flare, ½ in. FPT by ¼ in. flare
6. Flare seal bonnet, ¼, ⅜, ½, ⅝, ¾ in.
7. Fusible metal plugs, 150°–162° F. melting, ⅛, ¼, and ⅜ in. male pipe
8. Strainer union, 150 mesh, ¼ by ⅝ in., ¼ by ¼ in.
9. S.A.E. flared fittings — coupling nuts, reducing nuts, caps, plugs, union couplings, half union couplings, female couplings, pipe plugs, reducing couplings, fitting reducer, swivel nut valve connector, bushings, union elbows, half-union elbow, female elbow, valve connectors, extra heavy half union, brass tee, reducing tee, M.P.T. on run tee
10. Wrought copper fittings: elbows, 90°, straight, 90°, reducing, 45°, straight, 90°–45° street elbows
    Tees, wrought, reducing
    Reducing couplings
    Return bends
    Unions
    Reducing bushings
    adapters

FLUX
1. Brazing
2. Cast iron
3. Aluminum
4. Soldering

FUSES
1. Clear window, 6, 8, 10, 15, 20, and 30 amps.
2. Cartridge, 6, 8, 10, 15, 20, 25, and 30 amps.

GASKETS
1. Inner, door seal, ½ in. dia. by ¾ in. flange
2. Rubberized fabric, 3/16, ¼, 5/16, ⅜, ½, and ⅝ in. cushion diameter; ¼, 5/16, ⅜, ½, 9/16, and ⅝ in. flange
3. Grease proofed, ¼, 5/16, ⅜, and ½ in. cushion diameter
4. Alloy metal, .006, .010, and .015 in. thickness
5. Asbestos, 1/64, 1/32, and 1/16 in. thickness, 24 by 36 in. sheets
6. Flare gaskets, copper, ¼, ⅜, ½, ⅝, and ¾ in. I.D.

HOSE, PURGING — ¼ in. I.D. to ½ in. O.D., 50 ft. lengths

JOINT COMPOUND

KEYS, WOODRUFF — ⅛ by ½ in., ⅛ by ⅝ in., 1½ by ¼ in.

LAPPING PAPER — No. 320 fine, No. 400 very fine, No. 600 finest

LEAK DETECTOR — 2 oz. to 1 gallon containers

OIL
1. Graphite penetrating
2. Thread cutting
3. Compressor

OXYGEN

REFFRIGERANTS
1. Sulphur dioxide, 25, 100, 150 lb. tanks
2. Methyl chloride, 15, 60, 100, and 140 lb. tanks
3. Freon, F12, 25, and 145 lb. tanks
4. Freon, F22, 22, and 125 lb. tanks
5. Freon, F114, 145 lb. tanks
6. Methylene chloride, 1 qt. to 5 gal.

ROD, WELDING
1. Steel, 1/16 in. diameter
2. Bronze, 1/16 in. diameter

SCREWS, ALLEN SET — No. 10 by 3/16 in., ¼ by ¼ in., 5/16 by 5/16 in., ⅜ by ⅜ in., 7/16 by 7/16 in., ½ by ½ in.

SEALING COMPOUND — Insoluble in refrigeration gases

SILICA GEL — 18–20 mesh for liquid line, 6–12 mesh for suction line

SOLDER
1. 50–50
2. Silver
3. 95–5

STEEL, WOOL — No. 0, fine, No. 1, Standard

STRAP, PERFORATED BRASS — ½ to ¾ in. wide

TAGS, IDENTIFICATION

TAPE
1. Friction, ¾ in.
2. Rubber, ¾ in.

TUBING
1. Copper capillary, .031, .040, .050 in., I.D.; .091, .110, .120 in., O.D.
2. Soft copper, 50 ft. rolls, ⅛ in. O.D., .030 in. wall thickness; 3/16 in. O.D., .030 wall thickness; ¼ in. O.D., .030 in. wall thickness; 5/16 in. O.D.; .032 wall thickness; ⅜ in. O.D., .032 wall thickness; ½ in. O.D., .032 in. wall thickness; ⅝ in. O.D., .035 in. wall thickness; ¾ in. O.D., .035 in. wall thickness
3. Hard copper, 20 ft. lengths, ¼ in. O.D., .025 in. wall thickness; ⅜ in. O.D., .030 in. wall thickness; ½ in. O.D., .035 in. wall thickness; ⅝ in. O.D., .040 in. wall

(Continued on page 86A)

AMONG THE "700"

Yes, 700 or more styles and sizes of envelopes are carried in stock at Western. From Coins to Baronials; Passbook to Wax Packing List envelopes. A myriad of styles and hundreds of sizes. Western has one of the most complete lines of envelopes in the nation.

• • •

Graphic Arts instructors will find a wealth of information for their students in a series of file folders published by Western covering some of these 709 grades and styles. Send for your free folders, today. Mark your request to the attention of the Advertising Department.

Western States
ENVELOPE COMPANY
1616 WEST PIERCE ST., MILWAUKEE 46, WISCONSIN

Over 2000 wood shop Instructors look to

The
Upholstery Supply CO.
for their Special Hardware requirements.

PROJECTS NEVER BEFORE POSSIBLE IN A SCHOOL SHOP BECAUSE OF SPECIAL HARDWARE REQUIREMENTS NEED *NOT BE PASSED UP NOW.*

You Too Can *"Make Life Easier"* If You Have and Use

CATALOG K

Its Yours - FREE - and All Prices Are Strictly Wholesale to Schools.

Write For Your Copy NOW

●

THE UPHOLSTERY SUPPLY CO.
1033 N. Fourth St. Milwaukee 3, Wis.

Send
Us
Your
Lumber
Plywood
Dowel
Specifications
for
Quotation

●

T. A. FOLEY LUMBER CO., INC.
Lock Drawer #336 Paris, Illinois

(Continued from page 84A)

thickness; ¼ in. O.D., .042 in. wall thickness; ⅜ in. O.D., .045 in. wall thickness; 1⅛ in. O.D., .050 in. wall thickness; 1⅛ in. O.D., .055 in. wall thickness; 1⅛ in. O.D., .060 in. wall thickness

4. Sponge insulation, ¼ in. I.D., ⅜ in. O.D.; ⅜ in. I.D., ½ in. O.D.; ⅜ in. I.D., 1 in. O.D.; ½ in I.D., 1 in. O.D.; ⅝ in. I.D., 1 in. O.D.; ¾ in. I.D., 1¼ in. O.D.
5. Dehydrated copper, 5/10 in. O.D., .030 in. wall thickness; ¼ in. O.D., .030 in. wall thickness; 5/16 in. O.D., .030 in. wall thickness; ⅜ in. O.D., .032 in. wall thickness; ½ in. O.D., .032 in. wall thickness; ⅝ in. O.D., .035 in. wall thickness; ¾ in. O.D., .035 in. wall thickness
6. Sponge rubber, ¼ in. I.D., ¾ in. O.D.; ⅜ in. I.D., ¾ in. O.D.; ⅜ in. I.D., 1 in. O.D.; ½ in. I.D., 1 in. O.D.; ⅝ in. I.D., 1 in. O.D.; ¾ in. I.D., 1¼ in. O.D.

NEWS NOTES

(Continued from page 77A)

project was also concerned with the liaison maintained between industry and the school system, particularly schools in industrial areas.

The seminar was provided by the Department of Industrial Teacher Education; Gerald Baysinger planned and directed the seminar, and Dr. G. Harold Silvius and Dr. Willard M. Bateson participated extensively as discussion leaders.

SOUTH BEND LATHE CELEBRATES 50TH ANNIVERSARY

Many new and improved products are introduced in a Golden Anniversary Catalog just published by South Bend Lathe Company, builders of precision machine tools since 1906. Attractively bound in a gold cover, the 80-page book covers the entire line of South Bend precision engine lathes, toolroom lathes, turret lathes, shapers, pedestal grinders, and drill presses.

Also shown for the first time are the new South Bend vertical spindle milling machine and a new 13-in. swing turret lathe. Attachments, chucks, tools, and accessories for all South Bend machine tools are included.

Specifications including capacities, floor space requirements, and shipping weights for all machines are clearly tabulated. This catalog will be free on request.

NATIONAL CONTEST IN STUDENT PHOTOGRAPHY

Photographic achievement among high school students will again gain national recognition through the 11th Annual National High School Photographic Awards sponsored by the Eastman Kodak Company. This competition has been placed on the approved list of national contests and activities for 1955–56 by the National Association of Secondary School Principals, and is open to students throughout the United States and its territorial possessions.

The 1956 Awards is open to students in daily attendance (grades 9–12) at any public, private, or parochial high school in the United States and its territories. There is no limit to the number of photos an entrant may submit. The primary qualifications are that the pictures must have been taken by the students themselves, since April 1, 1955, and that these same photos have not been previously entered in any national contests. Entries can be sent in between January 1 and March 31, 1956. Winners will be announced in May of 1956.

Entries will be judged in four classes: (1) School Activities; (2) People (away from school); (3) Pictorials; (4) Animals and Pets. The following prizes will be given for *each class:* first, $300; second, $200; third, $100; special prize, $50. There will also be 240 honorable mention awards of $10 each.

Full information may be obtained from the National High School Photographic Awards, 343 State Street, Rochester 4, N. Y.

♦ The first Parent Education Workshop was held in the Norway-Paris area, at the Norway High School, Norway, Me., on November 19, 1955.

In his speech, "Let's Listen to Youth," Howard Blasenak, Augusta, director of guidance, public schools, explained the basic concepts of guidance to a group of 25 representatives of 13 western Maine towns attending this workshop.

Mr. Blasenak explained to the group specific types of problems with hopes the members would understand the responsibility of home, schools, church, and other community agencies. He told the listeners of the studies recently done or in process at Boston University.

The program, arranged by Mrs. Lawrence Prentice, Berwick, Parent Education chairman of the Maine Congress Parent-Teacher Association, and Mrs. Samuel McFall, Augusta, chairman of Parent Education of the Fifth District, opened at 9:30 a.m., with the registration of representatives, and included reports of the four discussion groups of various problems under group leaders. The concluding hour was devoted to a question period.

♦ Recently V.E.C. has released the following study lessons, filmstrips and manuals: No. 1554, Save Our Soil; No. 1556, Bermuda To-

(Continued on page 99A)

PRACTICALLY EVERY PRINTING PLANT IN THE WORLD USES ONE OR MORE OF THESE
Rouse PRODUCTS
For absolute accuracy and extra profits, order Rouse time-saving equipment. Write for complete illustrated catalog—today!
No. 40 Lead and Rule Cutter
Slug Clippers
No. 2 Band Saw
Register Quoins
Hand Miterer
Economy Vertical Miterer
Composing Stick
Make-Up Rule
Line Gauge
Sennett Positive Assembler
Newspaper Wall File
Line Slug Cutter
Type Mortiser
Form Truck
Tympan Paper Holder-Vertical or Horizontal
Press Seat
H. B. ROUSE AND COMPANY
2314 NO. WAYNE AVE. • CHICAGO 14, ILLINOIS
50 YEARS OF SERVICE TO THE PRINTING INDUSTRY

For Over 30 Years

LUMBER

HAS BEEN OUR BUSINESS
FOREIGN and DOMESTIC
HARDWOODS – SOFTWOODS

●

Our Woodcraft Department Specializes in

LUMBER of All Kinds
for
School Shops

SEND FOR OUR "WOODCRAFT" CATALOG

COTTON-HANLON
Odessa New York

SINCE 1920

Paxton

LUMBER and PLYWOOD

has proven to be of top quality in the School Shop. Nothing takes the place of experience. Paxton has been serving the schools satisfactorily for 35 years. You can depend upon Paxtons!

ARE YOU SATISFIED?

Write the nearest yard for your New Free Catalog

FRANK PAXTON LUMBER COMPANY

FRANK PAXTON LUMBER CO.

800 First St. N.W.....Albuquerque, N. M.
5701 West 66th St.....Chicago 38, Ill.
Box 6796, Stockyard Station.Denver, Colo.
Box 683.....Des Moines, Iowa
Box 1225.....Fort Worth 1, Texas
6311 St. John Ave.....Kansas City, Mo.

A COMPLETE CERAMIC SERVICE FOR SCHOOLS

Best in Kilns, Cress, Amaco, Rogers - Craftool Potter's Wheels - B & I Wheels, Drakenfeld Glazes and underglazes - Amaco Products - Duncan famous *Brushing* glazes (EZ-Flow) - Holland Molds - Atlas Sprayers - Landcraft Original molds - Finest red sable brushes - Modeling and turning tools - Gold writing pens - Books and Periodicals.

Complete Copper Enameling Equipment and Supplies

Let us help you with your ceramic needs. Our twelve years experience teaching and supplying schools with ceramic materials has taught us the right products and techniques to use. We can help you with your problems. Information on setting up new shops.

Catalogues Available:

Ceramic • Molds • Copper Enameling
Free to Schools or Ceramic Teachers.

SEELEY'S CERAMIC SERVICE
7 Elm Street Oneonta, New York

ALL NEW, COMPLETE CATALOG OF WOOD & WOODWORKING EQUIPMENT *FREE* TO INSTRUCTORS

Finest Domestic and Rare Woods... Molding... Tools ALL AT LOWEST PRICES

INSTRUCTORS! Just mail coupon for your FREE COPY (25¢ to students) of our giant new woodworking catalog. We are America's largest source of fine domestic and rare imported woods for projects. Also bandings, veneers, inlays . . . all shown in full color. Includes over 250 scroll patterns. See newest tools, equipment and hard-to-find cabinet hardware. Rush your request today!

- 128 pages . . . many in full color
- Newest project ideas
- Embossed mouldings, carved ornaments, matched plywoods and veneers
- Same day shipment guaranteed

CRAFTSMAN WOOD SERVICE CO.
Dept. F-3, 2729 Mary St. Chicago 8, Ill.

CRAFTSMAN WOOD SERVICE CO., Dept. F-3
2729 Mary Street, Chicago 8, Illinois
Send new WOODWORKER'S HANDBOOK — FREE (enclose 25¢ if student)

Name.....
Address.....
City.....Zone.....State.....

--BRADLEY UNIVERSITY

Announces the 1956 Summer Session

Comprehensive courses are offered in Industrial Arts and Industrial Education at both undergraduate and graduate levels during each of two terms.

Balanced Professional and Shop Courses ***Outstanding Guest Professors***

A wide variety of courses are offered in the following areas:

BUSINESS ADMINISTRATION
EDUCATION
ENGINEERING
INDUSTRIAL ARTS
INDUSTRIAL EDUCATION
FINE AND APPLIED ARTS
LIBERAL ARTS AND SCIENCE
Work Shops in —
EDUCATION, RACE AND INTER-GROUP RELATIONS, SPEECH

Six semester hours credit may be earned in each of the five-week sessions.

First Term, June 11—July 16
Second Term, July 17—August 18

For complete information write Director of Summer Session, Bradley University, Peoria, Illinois

THE PENNSYLVANIA STATE UNIVERSITY
Department of INDUSTRIAL EDUCATION

1956 SUMMER SESSION
INTER-SESSION — June 11-June 29
MAIN SESSION — July 2-Aug. 11
POST SESSION — Aug. 13-Aug. 31

Vocational Industrial and Industrial Arts Education

Doctors, Masters and Baccalaureate Degrees

Separate graduate and undergraduate curricula in vocational industrial and in industrial arts education for in-service teachers, supervisors, administrators, and other qualified individuals. Short unit courses dealing with national, state and local problems.

For further information and catalog address:
Director of Summer Sessions
Room 102, Burrowes Building

THE PENNSYLVANIA STATE UNIVERSITY
University Park, Pennsylvania

★ ★

SPECIALIZED TECHNICAL EDUCATION

Wide choice of training programs for specific career objectives

B.S. Degree in 36 to 42 months

ELECTRICAL ENGINEERING
Major in Electrical Power or Electronics

MECHANICAL ENGINEERING
Major in Design, Plant Engineering or Metal Fabrication

Success in the expanding, fascinating areas of Electrical and Mechanical Technology will be influenced by the type of educational program the student chooses.

Important advantages are gained at this technical institute and college of engineering. For example, the Technician certificate is achieved upon completion of the first third of the B.S. degree curriculum. The comprehensive nature of the courses gives other special advantages in securing positions in the service, technician and engineering levels.

Faculty of Specialists. Over 50,000 alumni. Annual enrollment from 48 states and 23 countries. A nonprofit institution. 53rd year. Day or evening classes. Military, practical or academic training evaluated for advanced credits. Approved for Veterans.

COURSES
ENGINEERING . . . B. S. Degree in 36-42 Months
Electrical Engineering Major in Electrical Power or Electronics
Mechanical Engineering Major in Design, Plant Engineering or Metal Fabrication
ENGINEERING TECHNICIAN . . . . 12 to 18 Months
Electro Technician
Electronic Technician
Mechanical Technician
Radio Technician
Radio and Television Technician
Air Conditioning Technician
TECHNICAL SERVICE . . . 6 to 12 Months
Electrical Service
Welding Operator
Refrigeration Service
Heating Service
Radio and Television Service
PREPARATORY . . . 3 Months

Write for new bulletins in Electrical Technology, Mechanical Technology, Radio and Television. New 1955-1956 General Catalog also now available. Please address Dept. IA-356.

TERMS START APRIL, JULY, SEPTEMBER, JANUARY

MILWAUKEE SCHOOL of ENGINEERING

Technical Institute • College of Engineering

1025 North Milwaukee St. Milwaukee 1, Wis. Phone: BR 6-4006

WAYNE UNIVERSITY

1956 Summer Session
JUNE 25
Six, Eight, or Ten Weeks

AUTOMOTIVE TEACHERS: Short unit courses in Engine Analysis, Electrical Systems, Carburetion, Brake and Chassis Construction and Service. (Conducted by Automobile and Equipment Manufacturers), Graduate or Undergraduate Credit.

CONFERENCE ON INDUSTRIAL ARTS TEACHER EDUCATION: Group work with emphasis on Off-Campus Student Teaching, development of Cooperative Programs, and review of Tentative Standards for Accreditation; visits to Detroit industries. Graduate Credit (August 20-25).

GRADUATE STUDY: Personal counselling and individualized programs leading to the professional degrees: M.Ed. and D.Ed. Special graduate programs leading to certification of instructors for COMMUNITY COLLEGES.

CERTIFICATE COURSES: Individual study and organized classes to validate Vocational Certificates; undergraduate or graduate credit if desired. Personal assistance in planning programs to meet certification requirements for teaching, supervision and administration.

DEGREE PROGRAMS for Industrial Arts, Special Education, Vocational and Technical Teachers, and for staff members of industrial training departments.

SCHOLARSHIPS AVAILABLE for non-residents.

LIVING ACCOMMODATIONS on campus at moderate cost. A wide and varied program of social and professional activities has been planned.

WRITE TO:

Department of Industrial Education, College of Education, Wayne University, 5442 Second, Detroit 2, Michigan.

CATALOGS AND BULLETINS WILL BE MAILED ON REQUEST.

NEWS NOTES

(Continued from page 86A)

day; No. 1558, Conquest of the Desert; No. 1559, Colorado, Western States Series; No. 1560, Our Country; and No. 1562, Who's Who in Our Wildlife Zoo (animals).

Each lesson is accompanied by a complete teacher's manual.

For further information write to V.E.C., Inc., Madison 4, Wis.

♦ Nearly 200,000 boys and girls, who qualify for better rates through driver training courses, will become eligible for reduced automobile insurance rates at the close of this school semester, according to Stuart B. Wright, general manager, American Automobile Association Wisconsin Division.

Some insurance companies have been giving 10 to 15 per cent reductions to trained drivers since 1953.

New Publications

The Machinist Dictionary

By Fred H. Colvin. Cloth, 496 pp., 6¼ by 8¾ in., illus., $7.50. Simmons-Boardman Publishing Co., New York, N. Y.

An excellent book giving many illustrations besides information and definitions about machine-shop terms. The book also contains many useful tables of various kinds.

Besides finding a welcome in the machine shops of high schools, technical schools, and vocational schools, it will answer a real need in the offices of many industrial firms.

The New Basic Science

By J. Darrell Barnard and Lon Edwards. Cloth, 632 pp., 6⅞ by 9⅜ in., illus., $4.20. The Macmillan Co., New York, N. Y.

An exceedingly interesting book which contains much valuable information for the high school student as well as for the adult who is interested in science. The book is well illustrated, and many of the illustrations are in color.

The book is divided into 31 units which treat of the meaning and use of science; what is above and below the surface of the earth; the nature of the universe; the sun, moon, and stars; radiant energy; electricity; heat; weather and climate; health; conditions affecting the body; plants and animals; conservation; work and power; transportation and communication; and materials of construction.

Engineering Drawing and Geometry

By Ranodlph P. Hoelscher and Clifford H. Springer. Cloth, 512 pp., 8¾ by 11¼ in., illus., $8. John Wiley & Sons, Inc., New York, N. Y.

A text designed for freshman engineering students. Its purpose is to develop engineers rather than draftsmen; hence, perfectionism in lettering and manual skill in drafting have not been aimed at.

Workbooks to be used with this text also are available for both drawing and geometry. The book also contains a chapter on shop terms and processes. Other chapters explain about drawings for interchangeable assembly: the geometry of engineering drawing; axonometric projection; maps, architectural, structural, pipe, machine, tool, welding and patent office drawing.

The appendix contains many useful tables.

Fundamentals of Press Tool Design

By W. F. Walker. Cloth 152 pp., 5⅝ by 8⅜ in., illus., $4.75. Philosophical Library, Inc., New York, N. Y.

This book should be of great use to designers of press punches and dies. It contains 29 chapters which present the material under the following headings: open tools, pillar die sets, cutting tools, blanking, piercing, follow-on tools, piercing and cropping, notching, combination tools, perforating, clipping, shaving tools, stripping, stops, pilots, pressure cushions bending, forming, planishing, plunging, curling, raising, cupping, drawing, compound tools, calculation of blank sizes and tool materials.

Fundamentals of Machine Shop Practice

By Emanuele Stieri. Cloth, 322 pp., 8¾ by 11¼ in., illus., $5. Prentice-Hall, Inc., Publishers, New York, N. Y.

This text presents a clear and concise presentation of the tools, both hand and power, that are used in the machine shop.

The book is well illustrated. The tools covered in the twenty chapters into which it is divided are: hand and bench tools, measuring and layout tools, bench and engine lathe, lathe tools and operations, spinning lathe, drilling machines, drilling procedures and machines, milling machines and their operations, shapers, planers, and grinders.

Forging and Welding

By Robert E. Smith. Cloth, 160 pp., 7¾ by 10¼ in., illus., $3.50. McKnight & McKnight Publishing Co., Bloomington, Ill.

A complete text on forging. Oxyacetylene

(Continued on next page)

DESIGNED IN SCHOOLS
BUILT BY HAMILTON
Hamilton Student Tables
...hard-working and handsome,
in 6 smart new colors!
Student art and drafting tables by Hamilton are smartly designed, solidly constructed of Northern Hard Maple and offered in a range of handsome new finishes—Blonde, Driftwood, Ocean Spray, Saddle Brown, Honey Maple or Granite Gray.
Student drafting table
These highly practical units are only a small part of Hamilton's current school equipment line. Drop us a card or letter, and we'll keep you completely posted on new equipment for schools—by Hamilton.
Hamilton
LABORATORY EQUIPMENT
Student art table
HAMILTON MANUFACTURING COMPANY • Two Rivers, Wisconsin

NEW PUBLICATIONS

(Continued from previous page)

and inert gas welding, a.c. and d.c. welding are all clearly described and well illustrated.

A total of 73 units are presented to the reader, covering technical information, as well as safe procedure in an easy-to-understand manner.

Automotive Electrical Equipment

By William H. Crouse. Cloth, 489 pp., 6⅛ by 9¼ in., illus., $4.75. McGraw-Hill Book Co., New York, N. Y.

This is the third edition of this book. It presents the information on construction, operation, and maintenance of the electrical equipment which makes the automobile function, and the principles of which must be understood by the servicemen who service automobiles. The descriptions and instructions are clear and to the point, and the illustrations are very good.

The storage battery; maintenance of battery; cranking-motor trouble-shooting and service; generator fundamentals; theory of regulator operation and quick check of regulator system; checking and adjusting Auto-Lite, Delco-Remy, and Ford regulators; generator trouble-shooting and service; horns; engine and fuel requirements; ignition system, testing, and service; switches; indicating devices; headlights; accessories; periodic inspection of electric system; are all fully discussed.

The book also contains a good glossary.

Blueprint Reading for the Building Trades

By Joseph E. Kenney. Second edition, cloth, 120 pp., 9¼ by 12¼ in., illus., $4.75. McGraw-Hill Book Co., Inc., New York City.

This is the second edition of this book which presents the problem of blueprint reading in a very clear way to the mechanics who have to interpret the architect's drawings in the media now used by the building trades.

The book discusses the scope of architecture; the importance and use of blueprints; language, symbols, and conventions found on blueprints; the use of schedules and scale representations; brickwork and construction details; and different types of blueprints.

The book also illustrates examples of modern architecture, such as the Lever House, and the modern concrete house. It also shows how to estimate the cost of building and it contains several pages of architectural and building terms.

Shop Organization and Management

By Gilbert G. Weaver. Cloth, 183 pp., 6⅛ by 9¼ in., illus., $3.50. Pitman Publishing Corp., New York, N. Y.

A helpful aid to the shop teacher in planning, organizing, and managing his shop.

The twenty-five chapters of the book present a comparison between the school shop with the commercial shop; the function, construction, and location of a school in which industrial arts and vocational education is offered; how to plan a school shop; and making shop layouts.

It also shows how to select and purchase the tools, equipment, and materials needed in such shops; discusses accident prevention and occupational hygiene; and the teacher's liability and responsibility for accidents in his shop.

It also shows how to plan and produce job and instruction sheets; make, select, and store visual-aid equipment; how to place and follow up students; and how to co-operate with outside agencies.

There also is a chapter which discusses publicity and exhibits.

Wood Handbook

Prepared by The Forest Products Laboratory, Superintendent of Documents, Government Printing Office, Washington, D. C. Paper cover, 528 pp., 5⅞ by 9⅛ in., illus., 82 per copy.

This is the 1955 enlarged and completely revised edition of the U. S. Department of Agriculture's Wood Handbook.

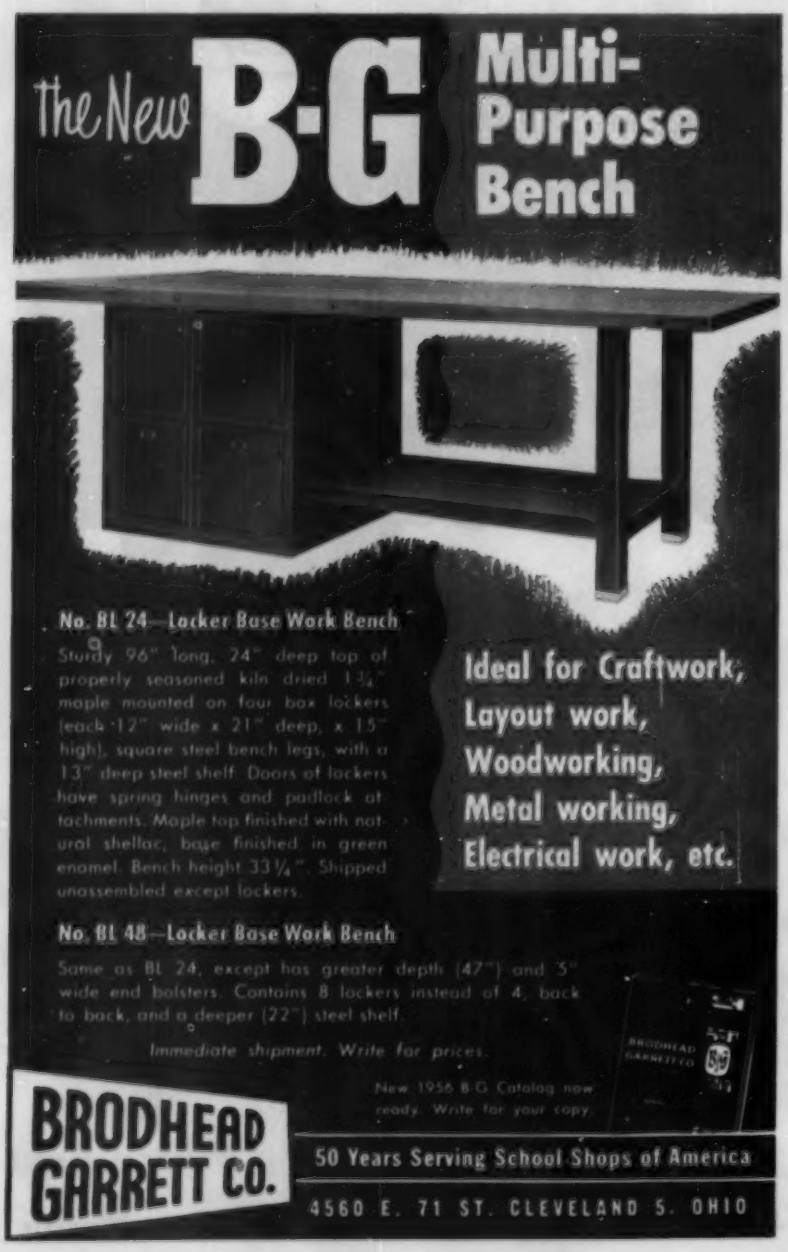
Since the handbook was first published in 1935, it has been recognized as the outstanding reference book on the properties and structural uses of wood. It is widely referred to as a basic authority.

Since 1935, basic information about wood has been greatly broadened, new wood products have been developed, and advanced engineering principles applied to wood construction of all kinds. The new edition of the handbook includes much basic information on these materials and processes.

A new section on plywood and other cross-banded products has been revised and enlarged. The completely revised section on glued wood lamination contains the most recent information on the characteristics, design, and strength of laminated members.

Two completely new sections conclude the revamped volume. The section on building fiberboards covers various types of insulation board and structural hardboard.

A national speed paving record was set with the laying of 393 feet of a 24-foot pavement in 24 minutes, 35 seconds. The paving material used was asphalt, an oil product. — *Petroleum Newsnotes.*


the New B-G Multi-Purpose Bench
No. BL 24—Locker Base Work Bench
Sturdy 96" long, 24" deep top of properly seasoned kiln dried 1¾" maple mounted on four box lockers (each 12" wide x 21" deep, x 15" high), square steel bench legs, with a 13" deep steel shelf. Doors of lockers have spring hinges and padlock attachments. Maple top finished with natural shellac, base finished in green enamel. Bench height 33¼". Shipped unassembled except lockers.
Ideal for Craftwork, Layout work, Woodworking, Metal working, Electrical work, etc.
No. BL 48—Locker Base Work Bench
Same as BL 24, except has greater depth (47") and 5" wide end bolsters. Contains 8 lockers instead of 4, back to back, and a deeper (22") steel shelf.
Immediate shipment. Write for prices.
New 1956 B-G Catalog now ready. Write for your copy.
BRODHEAD GARRETT CO.
50 Years Serving School Shops of America
4560 E. 71 ST. CLEVELAND 5, OHIO

OREGON
for STUDY and PLAY

1956
SUMMER SESSION
June 18 - August 10

OREGON STATE COLLEGE
Department of
INDUSTRIAL EDUCATION

Graduate or undergraduate work under competent instructors, amid outstanding facilities, and in a genuinely stimulating climate. Thrill to nearby scenic wonders . . . Pacific coast beaches Crater Lake National Park, Oregon Caves, Cascade Mountains, Cascade Lava Beds and the world-famous Columbia River Gorge are from two to four hours drive from the campus. The N.E.A. Convention, to be held in Portland July 1 through 6, will be an *integral* part of the *summer program.*

•

The student may plan a program which through successive summers at this widely recognized school, will lead to a bachelor's or master's degree. Approved programs carrying the recommendation of Oregon State College are accepted by all state departments of education for either a *Special* or a *General Secondary* Credential.

Technical Courses: All usual courses in Woodworking, Metal Working, Drafting and Design, plus advanced work in metal spinning, boat building, recreational handcrafts.

Professional Courses: *For IA majors* — Occupational Analysis, Project Analysis and Design, School Shop Planning, Tests and Measurements Seminars, Workshops and Symposiums. For T&I majors—Analysis and Course Construction, Methods and Materials, Shop Organization and Management, Principles and Objectives of VE, Seminars and Workshops.

General Education Courses include guidance and counseling, audio-visual education, school administration, and related areas.

For catalogs and detailed information write to

Director of Summer Session
OREGON STATE COLLEGE
Dept. C • Corvallis, Oregon
Authorized by Oregon State Board of Higher Education

Attend Summer School
in
COOL COLORADO

All Fields of Industrial Arts and Vocational Education
Work Leading to Bachelor's and Master's Degrees

—VISIT—

Central City Opera • Cheyenne Frontier Days
Red Rocks Outdoor Amphitheater
And many other scenic wonders

Four-Week Terms
June 18 - July 13 • July 16 - August 10

For Additional Information Address Registrar

COLORADO A and M COLLEGE
FORT COLLINS, COLORADO

1956 SUMMER SESSION

INTERSESSION June 4–June 29
SUMMER SESSION July 2–August 10
POSTSESSION August 13–September 7

WORKSHOP IN
Industrial Arts and Vocational Education
Classroom Activities Combined with Laboratory Experiences
Additional Professional and Technical Courses in
VOCATIONAL EDUCATION
INDUSTRIAL ARTS EDUCATION — ARTS AND CRAFTS
OCCUPATIONAL THERAPY — AERONAUTICAL EDUCATION
VOCATIONAL REHABILITATION

GRADUATE AND UNDERGRADUATE COURSES
leading to
DOCTOR'S, MASTER'S and BACCALAUREATE DEGREES
including NEW SIXTH YEAR PROGRAM

For information and complete Bulletins, write to
VOCATIONAL EDUCATION DEPARTMENT
SCHOOL OF EDUCATION

NEW YORK UNIVERSITY
Washington Square New York 3, N. Y.

Minnesota
SUMMER SESSION

SPECIAL WORKSHOPS AND COURSES IN INDUSTRIAL EDUCATION

GRADUATE STUDY with distinguished faculty.
UNDERGRADUATE WORK in more than 1000 outstanding courses.
LIBRARY, LABORATORY, and RESEARCH facilities of highest quality.
SPECIAL WORKSHOPS and INSTITUTES IN—

Government and Politics
Family Life
Biological Sciences
Physics
Chemistry
Industrial Education
Humanities
Speech and many others

—and RECREATION!—symphony and other concerts—plays—excursions — lectures — golf — tennis — swimming—fishing—campus in a distinguished cultural center yet located in the cool and refreshing Land of 10,000 Lakes.

FIRST TERM JUNE 11-JULY 14
SECOND TERM JULY 16-AUGUST 18

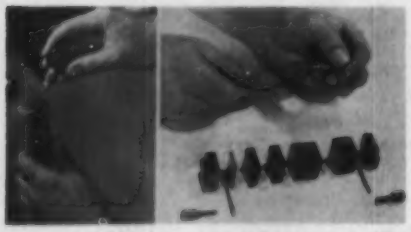
For Bulletin write Dean of Summer Session, 613 Johnston Hall

UNIVERSITY OF MINNESOTA
MINNEAPOLIS 14 MINNESOTA

Shop Equipment News

TORQUE SCREW DRIVER FOR ASSEMBLING GAUGE BLOCK

An important addition to DoAll's recently announced line of square gauge blocks and system of accessories is a specially designed torque screw driver. Under most existing systems for assembling square gauge blocks into working gauges, tie rods are passed through the holes in the center of the blocks and the stack is clamped by means of screws which fit internal threads at each end of the tie rods. Tightening the screws with an ordinary screw driver has led to inconsistency in dimension since the ultimate clamping pressure is dependent upon the unreliable element of "feel."



At left, the DoAll Torque Screw Driver. At right, Special V-Blocks and Pins included in DoAll Accessory Set

The DoAll Torque Screw Driver for square gauge block assemblies *slips* at a fixed torque. When used to tighten tie rod screws in a stack of square gauge blocks it develops a pressure which has been established by laboratory test as sufficient to maintain a rigid assembly of *wrung* blocks but is, at the same time, not great enough to cause distortion.

The torque screw driver is intended for use *after* the blocks have been cleaned and wrung by hand in the accepted manner. This procedure of assembling the blocks, plus the use of the DoAll Torque Screw Driver, makes it possible to achieve *consistent repeat accuracy* in assembling and reassembling stacks of the same dimension.

(For Convenience Circle Index Code 0301)

NEW MODEL TABLE SAW

A new model of the Wallace No. 11 Universal Saw with greater power, increased capacity, and new structural features is being produced by J. D. Wallace & Co., Inc.

New Wallace No. 11 Universal Saw

Retaining typical Wallace features of deep cuts with small blades (11-in. blade cuts 4 in. thick), high arbor speed, and extremely large table surfaces, the following new features are stressed:

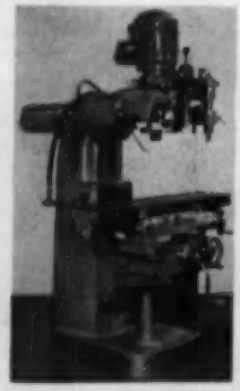
New drive units with increased power — up to 5 h.p., 3 h.p. — silent "Powergrip" drive requiring no lubrication, and totally enclosed fan cooled motors.

Structural changes include new one-piece solid cast iron table and frame, new "expandable" rip extensions with solid ground surfaces, new cabinet type base providing unrestricted motor ventilation and freedom from fire hazard.

(For Convenience Circle Index Code 0302)

NEW CINCINNATI CONTOURMASTER MILLING MACHINES

A new tool and die milling machine especially suited to the accurate, economical production of a wide variety of small sized dies and molds has been announced by The Cincinnati Milling Machine Company. These machines have been named Contourmaster because their basic field of operation is in the production of contoured shapes such as plastic molds, die casting dies, forging dies, master hobs, glass molds, etc.



Cincinnati Contourmaster Milling Machine

This machine has such helpful features as: automatic hydraulic depth tracer, anti-friction hand feed screws, front table hand control, unique swivel mount for cutter head and tracer mechanism, swivel turret mount for shaping attachment, micrometer depth gauge, and a host of others.

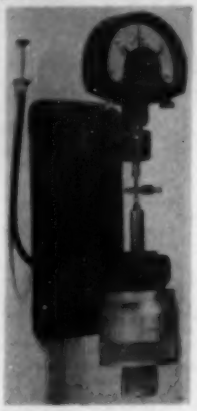
The machine is supplied in two styles — Style 1A is the basic machine having 16-in. table travel, Acme type feed screws for table and saddle, and with table feed handwheels at each end of the table. Style 1B has 22-in. table travel, anti-friction ball bearing type lead screws and nuts for effortless table and saddle movements, and a front table control handwheel located close to saddle feed handwheel.

A catalog illustrating and describing Contourmaster Milling Machines can be obtained upon request. Ask for publication No. M-1919-1.

(For Convenience Circle Index Code 0303)

A NEW BENCH MICROMETER

A new and differently designed indicating Bench Micrometer with nonrotating spindle is introduced by the George Scherr Company. Ideal for maintaining close limits on small work, it provides an excellent aid for fine small-parts-measurements. Spindle and anvil have bores for holding different shapes of measuring spindles.



New Bench Micrometer

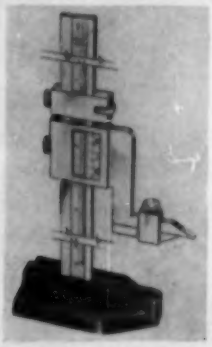
It measures by .0001 in. directly from the dull chrome finished oversize micrometer thimble, which is 1¾ in. in diameter and guarantees error-less reading without aid of magnifier. Its indicating head is graduated in .00005 in. with plus and minus .002-in. range, resulting in a total range of .004 in.

As a comparator it may be set without additional standards. An ingenious cable release retracts anvil instantly for rapid repeat measurements. Zero adjustment is accomplished by means of fine adjustment screw outside of housing. Two tolerance hands are quickly adjusted to any decided plus and minus tolerance.

(For Convenience Circle Index Code 0304)

"SUPER VERNIER" HEIGHT GAUGES

Brown & Sharpe announces a new line of "Super Vernier" Height Gauges that are really outstanding. These super vernier height gauges have a sunken dull chrome background on



"Super Vernier" Height Gauges

which machine cut graduations and figures appear in jet black, making the tools very easy to read. They have also the long vernier plate — twice as long as conventional vernier plates, which contributes further to easy reading and accurate setting.

With the offset marker and the extra-heavy slotted base which provides added stability,

(Continued on page 94A)

WANT MORE EFFICIENT—
LONGER LASTING STEEL STAMPS?

USE "SAFETY" WEDGE GRIP LETTERS and FIGURES

- No Spall
- No Mushroom
- More Service
- Knurled Grip
- Patented under No. 2,089,794
- Thumb Side Markings

Knurled sides for positive grip—patented design provides perfect balance and deeper impressions. Especially recommended for toughest jobs on steel castings, cylinders, tool steel, etc. All sizes available 1/8" to 1" characters. Write for Bulletin LF-50 and for Special Literature on Marking—for use in Industrial Arts Instruction.

Mecco SAFETY MARKING TOOLS
M.E. CUNNINGHAM CO.
1037 CHATEAU STREET, PITTSBURGH 33, PA.

REAL BUYS ON PLEXIGLAS FOR SCHOOL SHOP PROJECTS

COLORED ASSORTMENTS
Translucent, opaque and transparent reds, blues, greens, greys, whites and others.

FOR THESE LOW PRICES!
10 LBS. . . . $9.50
20 lbs., $17.00 • 40 lbs., $30.00 • 100 lbs., $70.00

FREE BOOKLETS
How to work with Plexiglas
Conversion Table & Chart

IMMEDIATE DELIVERY

cadillac plastic and chemical co.
15111 Second Blvd., Detroit 3, Michigan
727 Lake Street, Chicago 6, Ill.
2305 Beverly Blvd., Los Angeles 57, Calif.
2111 Olive Street, St. Louis 7, Mo.
652 Polk Street, San Francisco 2, Calif.

ONLY Sterling gives you HEAVY-DUTY FLASKS
engineered from ROLLED STEEL CHANNEL

Almost a half century of "Know-How" assures precision-built steel flasks fabricated to highest quality Standards. Sterling Flasks have these patented, life-prolonging features: all steel welded construction . . . solid reinforcing bars . . . heavy rolled steel flanges . . . square corners . . . full-width bearing. Available in a variety of styles and shapes. Write for catalog.

OVER 4500 FOUNDRIES USE STERLING STEEL FLASKS

STERLING WHEELBARROW CO.
Milwaukee 14, Wis., U. S.A.

New Vocational Texts

Automotive Mechanics, 3rd Ed. — *William H. Crouse*
Completely revised to include latest developments in the field, including power steering, power brakes, automatic transmissions, and tubeless tires. Improved readability. Correlated Filmstrips available.

Shop Theory, 4th Ed. — *Ford Trade School (Rev. by Fred Nicholson)*
Presents latest machines and newest shop techniques, with illustrative examples of typical jobs. New, easy-to-read pages and format. 650 illustrations, half of them new. Meets suggestions of 180 expert instructors.

**Correlated Text-Films available.*

Current Leaders

Mechanical Drawing, 5th Ed. — French and Svensen

General Shop — Groneman and Feirer

General Woodworking, 1955 Ed. — Groneman

General Metals — Feirer*

Elements of Radio Servicing, 2nd Ed. — Marcus and Levy*

Drawing, Sketching, and Blueprint Reading — Coover

Machine Tool Operation, Parts I and II, New Ed. — Burghardt & Axelrod

and Workbooks for Part I

Shopwork on the Farm, 2nd Ed. — Jones*

McGRAW-HILL BOOK COMPANY, INC.
New York 36 • Chicago 30 • San Francisco 4

You Can't Tell a Book By its Binding—But . . . .

you do want a book that is bound well — attractive, sturdy, able to withstand years of rough usage by active students.

Yes, binding is just a small item. But notice — the company that pays attention to the minor details is the one that can be trusted with the major details. This is true, whether it be clothing, cars, sports equipment, — or vocational books.

Thus you will find the careful binding on American Tech books is your first evidence of their overall quality. Heavy stitching, washable covers, and attractive cover design are three hallmarks of our clothbound texts.

Later, as you examine the contents, the illustrations, and the stimulating, well-written material, you see the same standards of quality throughout.

We invite you to examine Tech Books, now, before the Spring adoption period. Write for our complete catalogue or for on-approval copies of such vocational stand-outs as these:

1. GRAPHIC ARTS PROCEDURES: Karch $3.75
2. MACHINE SHOP OPERATIONS AND SETUPS: Porter-Lawshe-Lascoe $5.50
3. AMERICAN TECHNICAL SOCIETY'S DRAFTING: Giachino-Beukema $3.80
4. CABINETMAKING AND MILLWORK: Dahl-Wilson $4.95
5. FARM SHOP SKILLS IN MECHANIZED AGRICULTURE: Sampson, et al $4.95
6. FOUNDRY PRACTICE: Rusinoff $6.50
7. AUTOMOTIVE FUNDAMENTALS: Frazee-Bedell $5.25
8. SHEET METAL SHOP PRACTICE: Bruce $4.00
9. FUNDAMENTALS OF ELECTRICITY: McDougal-Ranson-Dunlap-Graham $3.50

Gentlemen:
Please send me on-approval copies of the books indicated by the numbers circled below:

1 2 3 4 5 6 7 8 9

☐ Please send me a complete catalogue.

Name .....
School .....
Address .....
City ..... Zone ..... State .....

AMERICAN TECHNICAL SOCIETY
Dept. W245
848 East Fifty-Eighth Street
Chicago 37, Illinois

SHOP EQUIPMENT NEWS

(Continued from page 92A)

these super vernier height gauges measure over the complete range of the instrument, from zero up. It is no longer necessary to remove the marker from the arm and reverse it for an over or under measurement. By merely loosening the clamp screw, the lower marker can be advanced or retracted, providing over or under measurements at will.

These gauges are being offered in three sizes: 12-, 18-, and 24-in., and they are made in two styles, No. 586 English Measure, and No. 588 English and Metric Measure.

(For Convenience Circle Index Code 0305)

BOICE-CRANE 10-IN. TILTING ARBOR SAW

A descriptive illustrated brochure on their new Master-Monotrol 10-inch tilting arbor saw has just been made available by Boice-Crane Company.

Master-Monotrol 10-in. Tilting Arbor Saw

This new 10-in. saw features accuracy, high capacity, simplified operation and several new safety factors.

(For Convenience Circle Index Code 0306)

NEW LIMA FAN-DUTY MOTORS

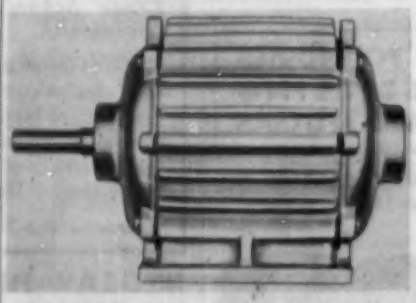
The Lima Electric Motor Company announces a new line of Totally Enclosed Fan-Duty Motors in ratings of ¾ to 20 h.p., especially designed for industrial and commercial use.

The new series is designated as Type EFD and incorporates a number of important features contributing to their extra-long maintenance-free life. Significant design features include: double-width prelubricated sealed ball bearings — the right amount of special non-hardening grease is sealed into the bearing — dirt, abrasives, and moisture are sealed out. Since this bearing is larger than those generally employed, it actually has double the amount of lubricant sealed in — these motors will run for years without *any* attention; deep, integrally cast fins provide greater heat dissipating surface and allow a smaller transverse section, which contributes to fan efficiency — less restriction to air flow; "extra-margin" windings have double-heavy formvar (Polyviny-acetal insulated) wire providing high dielectric and mechanical strength; optional connection boxes to fit any air-over-motor application.

For those installations requiring explosion proof construction, these motors are built in a Type EXFD which is approved by the Underwriters Laboratories for use in hazardous locations of volatile gases and explosive dusts.

These new Lima Fan-Duty Motors are available through the Company's thirty-four sales offices, and over two thousand Lima authorized dealer agencies throughout the United States, Canada, and abroad.

(For Convenience Circle Index Code 0307)

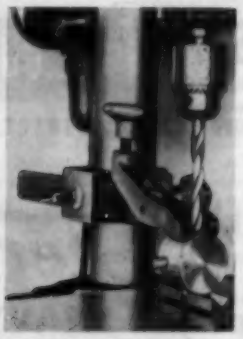


Lima Fan-Duty Motor

THE WETZLER DRILL PRESS CLAMP

The new Wetzler Drill Press Clamp has been designed especially to prevent accidents in drill press operations.

Unlike the conventional clamps, the Wetzler Drill Press Clamp fits on the 2¼-in. diameter column of any standard drill press and thus becomes a part of the drill press, available for fast and convenient use.



Wetzler Drill Press Clamp

The clamp is mounted on the column by means of a split collet for easy vertical adjustment, either up or down. When not in use, it may be swung out of the way readily. Once the clamp is mounted, it remains on the column and is always free and ready for use.

This new Wetzler Drill Press Clamp also is suited for pieces with curved surfaces, and while it will tightly grip large pieces, it is ideally suited for small work.

These clamps are manufactured by the Wetzler Clamp Company.

(For Convenience Circle Index Code 0308)

ROTOLITE FOR REPRODUCING DRAWINGS

A new low-cost machine for the reproduction of drawings, called Rotolite, has recently been developed and is being distributed nationally by Frederick Post Company.

Modern in design and compact in size, the Rotolite exposes drawings by means of a unique rotating light source. It can be plugged into a standard current wall outlet anywhere. The Rotolite can be installed hung to a wall or placed on a desk or table, requiring little space. No plumbing or special wiring is required, just plug it in and the Rotolite is ready for operation.

(Continued on page 96A)

HAND-WROUGHT IRON WORK IS *EASY*

with

Formit

TOOLS AND MATERIAL

Formit SCROLL DIE

Formit ALL

Anyone can create these beautiful projects without experience

- Material is cold formed
- Join components by squeeze riveting
- Formit material is correct thickness for easy, accurate forming
- Formit tools have been especially designed to use this material
- Complete instructions with each tool
- Formit tools and material are not expensive

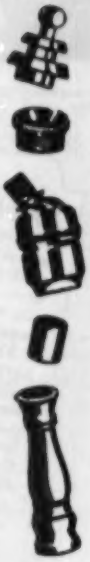
WRITE FOR FREE FORMIT DESIGN CATALOG AND PRICE LIST

BRAKE-ER Formit FIRST

P.O. Box 5061
ALBANY 5, NEW YORK

EDUCATIONAL
LAMP PROJECTS

Of particular interest to instructors — in woodworking, general shop, plastics, crafts, electricity, and many other shop courses. Students can design and make the body of the lamp. We supply all other parts necessary—sockets, cords, plugs, shades, harps, switches, etc. Over 700 different parts shown in wholesale catalog. A MUST for all instructors occupied with highly educational and useful projects. Send 25¢ today for wholesale price list and parts catalog.



THE GEARON COMPANY
Dept. 100-K3 • 27 S. Desplaines St. • Chicago 6, Ill.

What Are Fingers Worth?

New finger-saving Brett-Guard . . . you can see and saw at the same time!

COMBINATION HOLDING FIXTURE SAFETY TOOL "SAW GUARD" MADE WITH PLEXIGLAS

A new revolutionary visual Safety Guard and Production Saw Fixture combined, for all school circular table-type saws with 6" to 16" Blades.

SAFETY WITH VISIBILITY!

Transparent multi-purpose plastic Guard and Safety Tool allows clear view of work and protects student. Provides efficient method of making previously impossible-to-guard saw cuts — adjustable features allow: ripping, mitering, rabbeting raised panel, short and long cross-cutting, plowing, tenoning, drop sawing, dadoing, tenoning, diagonal sawing, and template cutting, etc. Protects where no other saw guard will function.

FOR FREE 30-DAY TRIAL, SEND BLADE DIAMETER, AND MAKE OF YOUR SAW. CATALOG TO SCHOOLS ON REQUEST.

BRETT-GUARD CO.
ENGLEWOOD, NEW JERSEY

Recently Revised

Bruce Shop Texts

INSTRUCTIONAL UNITS IN HAND WOOD WORK
F. E. Tustison, Arthur G. Brown, Louis Barocci — $2.64

MECHANICAL DRAWING, I & II
Edward Berg — Book I, paper, 92 cents; Book II, paper, 88 cents; complete edition, paper, $1.80; complete edition, cloth, $2.56

SHOP MATHEMATICS
C. A. Felker — $3.24

RURAL ELECTRIFICATION
J. P. Schaenzer — $3.75

AUTOMOTIVE SERVICE, Vol. I & II
Ray F. Kuns — Each volume, $4.95

AUTO MECHANICS, Books 1 & 2
Ray F. Kuns — Book 1, $1.65; Book 2, in preparation

THE BRUCE PUBLISHING COMPANY
703-A Bruce Building — Milwaukee 1, Wisconsin

DO YOU USE THESE DELKOTE PRODUCTS?

BOOK-SAVER®—the original liquid plastic for book repair—is in use in thousands of school classrooms and libraries—to mend broken backs, replace loose pages and signatures, and make almost invisible repairs on torn pages.

These schools tell us that BOOK-SAVER has two distinct sets of values. Teachers like it because even third-graders can use it successfully, and book repair teaches book care. School administrators find it a money-saving tool, because an 8-ounce bottle makes more than 100 major book repairs at a material cost of less than 2c apiece.

BOOK-SAVER comes in 8-ounce squeeze-bottles with handy applicator tip at $1.95; also 32-oz. wide-mouth glass jars for economical refilling.

BOOKOTE®—a specially formulated coating material—provides maximum protection for book covers against water, dirt, and wear. Paper or plastic covers are not needed. The color and appeal of the original cover designs are preserved, and the books are simply wiped clean with a damp cloth.

BOOKOTE is proving almost as universally popular as its companion product BOOK-SAVER. Many school systems make a practice of giving every new book, texts and library volumes alike, a protective coating of BOOKOTE before releasing for service.

In glass bottles for heavy-duty brush application, and in 12-ounce aerosol cans for easy spraying. The $1.95 size in either form will coat the entire covers of 50-75 average-size books.

SS-S-1

BOOK-SAVER and BOOKOTE are sold by all leading school supply distributors. If your regular supplier does not carry them, order direct.

DELKOTE, Incorporated
Box 1335, Wilmington 99, Del.
Box 574, Berkeley, California

Also makers of DEL-FIX, DELKOTE WOOD LACQUER, DELKOTE METAL LACQUER

SHOP EQUIPMENT NEWS

(Continued from page 94A)

The new Rotolite is available in three standard models accommodating prints up to 18, 27, or 42 inches in width, any length.

(For Convenience Circle Index Code 0309)

NEW BLACK AND DECKER SAW TABLE

A new Heavy-Duty Saw Table has been announced by The Black & Decker Mfg. Company, that will convert any of their portable electric saws, from the 6-in. to the 8-in. sizes, into the equivalent of a tilting-arbor bench saw in a few minutes. The table is sturdily constructed with aluminum top and steel legs.

The New Black & Decker Heavy-Duty Saw Table

A top dimension of 22¼ by 22¼ in., gives one of the largest working portable saw tables on the market. Bevel cuts up to 45 deg. can be made. There is ample room in front of the blade to handle boards up to 12 in. wide. Blade height is adjustable. Equipment includes an accurate adjustable miter gauge, and a rip fence that extends the full length of the table top.

The new saw table has two important safety features: an exclusive plastic safety shield designed to protect the eyes from sawdust particles that is mounted to adjust at any position, and an original knee-action cutoff switch so that the saw can be turned off instantly. The table stands 32½ in. high and weighs 44 lb. When the new Black & Decker 6½-in. Heavy-Duty Saw is mounted the maximum depth of cut ranges from 2$^{9}/_{32}$ in. at 90 deg., and 1$^{13}/_{16}$ in. when the saw is tilted to a 45-deg. angle.

For a limited time, the Heavy-Duty Saw Table and the 6½-in. Heavy-Duty Saw are being offered in combination by Black & Decker at a special reduced price.

(For Convenience Circle Index Code 0310)

THE LASZLO UNIVERSAL HANDPRESS

Until now the average artist could practically not have a lithographic press, an etching press, a block printing press, and a proofing letterpress in his studio; it would have meant a lot of space and a lot of money.

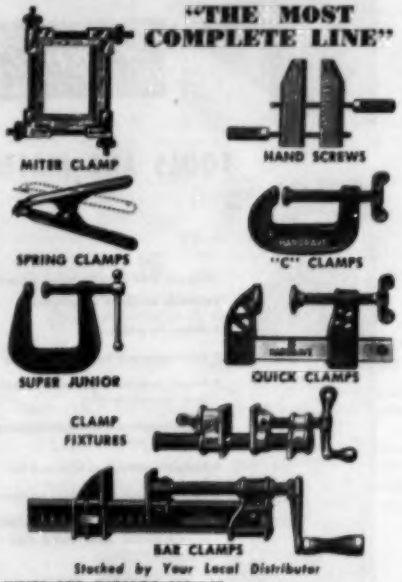
There are compositions and designs, that lend themselves for the fine linework of the etching; others fit the tones of a lithograph; and some designs gain a desirable abstract quality in the simplicity of the woodcut.

The modern artist who has a Laszlo, is not limited to any one graphic medium.

The illustration shows the Laszlo Press

(Continued on page 98A

CLAMPS
Individually Power-Tested for Better Performance
"THE MOST COMPLETE LINE"



Stocked by Your Local Distributor

WRITE FOR CATALOG NO. 65
Shows a complete line of Clamps for all purposes, openings from ⅝" to 12" and depths from ½" to 16". Chisels, Punches, Masonry Drills for hand and power hammers, Carbide Rotary Drills, Gasket Cutters, File Cleaners, etc.

THE CINCINNATI TOOL CO.
Waverly & Main Cincinnati 12, Ohio

IMPORTED VOCATIONAL DRAWING SET

No. 711 8 Pc. Combination Bow Drawing Set. Velvet Lined, 2-Button Case.
$2.65 Ea. $30.80 Dz.

Subject to Educational Discounts
ORDER TODAY!
SEND FOR FREE 60-PAGE CATALOG
ALVIN & COMPANY
853 Palisado Ave.
WINDSOR, CONN.
ALVIN

DIRECTORY OF MANUFACTURERS' PRODUCTS

This directory is published as a convenient guide to sources of supply, covering the products of manufacturers carrying product information in this ANNUAL NUMBER. For alphabetical index of manufacturers' advertising see page 109. To obtain products not included in this directory, quotations or additional information to help you make up your specifications, lists of equipment, etc., address Industrial-Arts Service Division, or use coupon on page 110.

A

ADJUSTABLE CURVE RULERS
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Keuffel & Esser
Post Company, Frederick
Weber Co., F.

AIR CONDITIONING EQUIPMENT
Curtis Mfg. Co.

AIR FILTERS
American Air Filter Co.
Logan Engineering Co.

ALUMINUM PROJECTS
Hubbell Metals, Inc.
Reynolds Metals Co.

AMMETERS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Weston Electric Instrument Corp.

ANGLE PLATES
Challenge Machinery Co.

ANVIL BASE
Stoner Wood Products Co.

ANVILS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

ANVIL TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Stanley Tools

ARBOR PRESSES
Brodhead-Garrett Co.
Dake Engine Company
Patterson Bros.

ARC-WELDING SETS & EQUIP.
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.

ARCHERY MATERIALS
Indianhead Archery & Mfg. Co.

ART METAL TOOLS
Berkroy Products, Inc.
Brodhead-Garrett Co.
Dixon, Inc., William
Elliott Co., B. K.
Metal Crafts Supply Co.
Metal Goods Corp.
Patterson Bros.
X-acto, Inc.

AUTOMOTIVE ELECTRICAL UNITS
Delco-Remy Div., General Motors Corp.

AUTOMOTIVE TOOLS AND EQUIPMENT
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Curtis Mfg. Co.
Duro Metal Products Co.
Lufkin Rule Co.
Millers Falls Co.
Starrett Co., The L. S.
Williams Co., J. H.

AWLS, TINNERS
Brodhead-Garrett Co.
Millers Falls Co.
Patterson Bros.

AXES
Brodhead-Garrett Co.
Plumb, Inc., Fayette R.

B

BABBITT FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.
Sunbeam Corporation

BAND SAW BLADES
Boice-Crane Co.
Delta Mfg. Co.
Duro Metal Products Co.
Millers Falls Co.
Oliver Machinery Co.
Patterson Bros.
Rouse & Co., H. B.
Simonds Saw & Steel Co.
Starrett Co., The L. S.
Walker-Turner Co., Inc.

BAND SAW BRAZERS, Electric
Boice-Crane Co.
Foley Mfg. Corp.
Oliver Machinery Co.
Walker-Turner Div.

BAND SAWS
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Kindt-Collins Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Parks Woodworking Mach. Co.
Patterson Bros.
Rouse & Co., H. B.
Walker-Turner Co., Inc.
Yates-American Machine Co.

BAND SAWS, METALCUTTING
Boice-Crane Co.
Brodhead-Garrett Co.
Duro Metal Products Co.
Kalamazoo Tank & Silo Co.
Oliver Machinery Co.
Patterson Bros.
Rouse & Co., H. B.
Walker-Turner Div.

BAND SAWS, PORTABLE
Brodhead-Garrett Co.
Delta Mfg. Co.
Patterson Bros.
Walker-Turner Co., Inc.

BAND SAW SETS
Brodhead-Garrett Co.
Oliver Machinery Co.

BENCH FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Johnson Gas Appliance Co.
Patterson Bros.
Sunbeam Corporation

BENCH-PLATES
Challenge Machinery Co.
Dixon, Inc., William
Patterson Bros.

BENCH TOPS
Craftools, Inc.
Hardwood Corp. of America
Patterson Bros.

BENCHES
Jewelers' and Metal Workers'
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Parent Metal Products, Inc.
Patterson Bros.

BENCHES, MANUAL TRAINING
Brodhead-Garrett Co.
Challenge Machinery Co.
Craftools, Inc.
Engineering Mfg. Co.
Hamilton Manufacturing Co.
Parent Metal Products, Inc.
Patterson Bros.
South Bend Lathe Works
Tolerton Co.

BENCHES — WORK
Challenge Machinery Co.
Craftools, Inc.
Patterson Bros.
Stoner Wood Products Co.

BENCH VISES
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Dixon, Inc., William
Millers Falls Co.
Morgan Vise Co.
North Bros. Mfg. Co.
Patterson Bros.
Parent Metal Products, Inc.
Stanley Tools

BENDERS, METALWORKING
Dixon, Inc., William
Hossfeld Mfg. Co.
O'Neil, Irwin, Mfg. Co.
Patterson Bros.

BINDERY EQUIPMENT & SUPPLIES
Black & Decker Mfg. Co.
Challenge Machinery Co.
Delkote, Inc.
Pratt Co., G. A.

BIT HOLDERS, EXTENSION
Brodhead-Garrett Co.
Greenlee Tool Co.
North Brothers Mfg. Co.
Patterson Bros.
Stanley Tools

BITS, Auger, Machine, Hollow Chisel, Router
Brodhead-Garrett Co.
Chicago-Latrobe Twist Drill Works
Connecticut Valley Mfg. Co.
Greenlee Tool Co.
Irwin Auger Bit Co.
Patterson Bros.
Stanley Tools
Walker-Turner Div.
Whitman & Barnes
Williams Co., J. H.

BITS, SCREW DRIVERS
Brodhead-Garrett Co.
Greenlee Tool Co.
Irwin Auger Bit Co.
Millers Falls Co.
North Brothers Mfg. Co.
Patterson Bros.
Stanley Electric Tool Div.
Stanley Tools
X-acto, Inc.

BLACKBOARD DRAWING SETS
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Keuffel & Esser
Post Company, Frederick
Weber Co., F.

BLACKSMITH TOOLS AND SUPPLIES
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Patterson Bros.
Stanley Tools

BLOWERS, FORGE
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.

BLOWPIPES, Brazing, Jewelers'
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

BLUE-PRINTING MACHINES, ELECTRIC
Dietzgen Co., Eugene
P & H Sales Corp.
Post Company, Frederick

BOARDS, DRAWING
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Engineering Mfg. Co.
Hamilton Mfg. Co.
Keuffel & Esser
Post Company, Frederick
Stacor Equipment Co.
Weber Co., F.

BOAT KITS
Castolite Co., The

BOOKBINDERS SUPPLIES
Black & Decker Mfg. Co.
Delkote, Inc.
Higgins Ink Co., Inc.
Pratt Co., G. A.

BORERS, WOOD
Brodhead-Garrett Co.
Connecticut Valley Mfg. Co.
Delta Mfg. Co.
DeWalt Products Co.
Oliver Machinery Co.
Patterson Bros.
Yates-American Machine Co.

BORING BARS
Armstrong Bros. Tools
Brodhead-Garrett Co.
Patterson Bros.
South Bend Lathe Works
Williams & Co., J. H.

BORING TOOLS
Armstrong Bros. Tools
Brodhead-Garrett Co.
Connecticut Valley Mfg. Co.
DeWalt Products Co.
Greenlee Tool Co.
Millers Falls Co.
North Bros. Mfg. Co.
Patterson Bros.
South Bend Lathe Works
Stanley Tools
Williams & Co., J. H.

BOW COMPASSES, DIVIDERS, PENS, PENCILS
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Keuffel & Esser
Post Company, Frederick
V & E Mfg. Company
Weber Co., F.

BRACES
Brodhead-Garrett Co.
Millers Falls Co.
Patterson Bros.
Stanley Tools

BRACKETS, SAWHORSE
Dalton Mfg. Co.

BRAD AWLS
Brodhead-Garrett Co.
Millers Falls Co.
Patterson Bros.
Stanley Tools

BRAKES, METALWORKING
O'Neil Irwin Mfg. Co.
Patterson Bros.
Stueck, Inc., W. Whitney

BRASS FURNACES, GAS
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.
Sunbeam Corporation
Western Materials Co.

BRASS TYPE
Brodhead-Garrett Co.

BRAYERS
Brodhead-Garrett Co.
Dixon, Inc., William

BRAZING TORCHES
American Gas Furnace Co.
Dixon, Inc., William
Patterson Bros.

BRISTOL BOARD
Brodhead-Garrett Co.
Keuffel & Esser
Post Company, Frederick
Weber Co., F.

BRITTANIA METAL
Metal Crafts Supply Co.
Patterson Bros.

BRUSHES, ARTISTS'
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Weber Co., F.

BRUSHES, CIRCULAR, BRISTLE AND WIRE (All Kinds)
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Dixon, Inc., William

BUFFERS, BENCH, PEDESTAL
Blount Co., J. G.
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., William
Millers Falls Co.
Patterson Bros.
Queen City Machine Tool Co.
Walker-Turner Div.

BURNERS, GAS
Dixon, Inc., William
Johnson Gas Appliance Co.

C

CABINET HARDWARE
Brodhead-Garrett Co.
Upholstery Supply Co.

CABINETS, Cuts, Furniture, Galleys, Inks, Type, and Rollers
Hamilton Mfg. Co.
Parent Metal Products, Inc.

CALIPERS
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Dixon, Inc., William
Elliott Co., B. K.
Lufkin Rule Co.
Millers Falls Co.
Patterson Bros.
Starrett Co., L. S.
Western Materials Co.

CARVING BLOCKS — Hardwood
Veneer Lumber & Plywood Co.

CARVING TOOLS for Wood and Linoleum
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Elliott Co., B. K.
Millers Falls Co.
Patterson Bros.
Stewart Clay Co.
X-acto Crescent Products Co., Inc.

CENTER LATHE
Brodhead-Garrett Co.
DeWalt Products Co.
LeBlond Machine Tool Co.
Patterson Bros.
South Bend Lathe Works
Walker-Turner Div.
Whitman & Barnes

CERAMICS, SUPPLIES
Brodhead-Garrett Co.
Craftools, Inc.
Electric Hotpack Co., Inc.
Plasticast Co.
Seeley's Ceramic Studio
Stewart Clay Co.

CHARTS
Brodhead-Garrett Co.
Nicholson File
Starrett Co., The L. S.

CHASING TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Metal Crafts Supply Co.

CHISELS, Cape, Cold, Grooving
Brodhead-Garrett Co.
Cincinnati Tool Co.
Delta Mfg. Co.
Duro Metal Products Co.
Millers Falls Co.
Patterson Bros.
Snap-On Tools, Inc.
Stanley Tools
Williams Co., J. H.

CHISELS, FRAMING, MORTISE
Boice-Crane Co.
Brodhead-Garrett Co.
Greenlee Tool Co.
Patterson Bros.
Stanley Tools

CHISELS, Metal Cutting and Wood Carving
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Duro Metal Products Co.
Greenlee Tool Co.
Millers Falls Co.
Patterson Bros.
Stewart Clay Co.
Williams Co., J. H.

CHUCKS, COMBINATION
Atlas Press Co.
Brodhead-Garrett Co.
South Bend Lathe Works

CHUCKS, DRILL
Brodhead-Garrett Co.
Chicago Latrobe Twist Drill Works

WILLIAMS

TOOLS for FEEL, FIT and FINISH

You can tell the difference the first time you work with Williams Tools. Designed and made by specialists, they are first choice of experienced industrial and automotive mechanics. In "The Broadest Line of Its Kind", you have a complete selection of tools which make your work easier and better. Why accept less than the best. Write today for Catalog 302.

J. H. WILLIAMS & CO.
423 Vulcan Street
BUFFALO 7, N. Y.

Name.....
Title.....
Address.....
.....

FREE CATALOG SENT ON REQUEST

SHOP EQUIPMENT NEWS

(Continued from page 96A)

clamped to the worktable, ready to print any type high block or litho stone or set printing type.

To print an etching, celluloid drypoint or a zinc lithoplate, just take the *chase* out and insert the *flatbed* between the two rollers.

Laszlo Universal Handpress

The setting of the *adjusting screws* determines the pressure. For instance, a monotype needs a light *kiss-pressure*, while a fine line etching requires very heavy pressure. The Laszlo has a pressure capacity of thousands of pounds.

The long *arms* of the Laszlo Press make the operation easy for the young student.

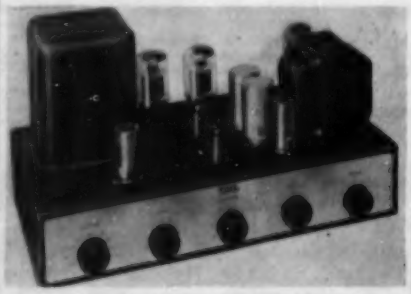
Notice: The Laszlo Universal Hand Press will be exhibited and demonstrated at the Western Arts Association's Convention at the Muelebach Hotel, Kansas City, Mo., March 24 to 29, 1956.

(For Convenience Circle Index Code 0311)

EICO 20-WATT HF AMPLIFIER KIT

Electronic Instrument Co. Inc., announces a new 20-watt ultra-linear Williamson-type high fidelity amplifier, in both kit and factory-wired form.

The new 20-watt ultra-linear Williamson-type high fidelity amplifier, including pre-amplifier with 5 positions of feedback equalization, variable turnover feedback tone controls, centralab compentrol and separate panel level control, is now in production. The



New 20-Watt HF Amplifier Kit

new HF20 features low distortion and increased power-handling capacity at both extremes of the audio spectrum. Complete and low-distortion equalization facilities, plus low-distortion, wide-range tone controls, and full Fletcher-Munson loudness compensation with a means of adjustment, create a preamplifier

(Continued on page 100A)

FREE!
W & B DRILL and REAMER INFORMATION

These charts and literature are available in limited quantities to professors, teachers and industry. They are of invaluable assistance to instructors, students, apprentices and experienced mechanics.

- Decimal equivalents chart is available in three sizes for pocket, desk and wall use.
- Twist drill applications chart is wall size and illustrates many types of drills, their use and how to sharpen.
- "Drill and Reamer Facts" covers in considerable detail the design, use and care of both high speed steel and carbide drills and reamers.
- "Drill and Tap Selector" provides quick selection of proper fractional, letter and wire gauge drill sizes for individual tap sizes.

W&B DRILLS REAMERS COUNTERBORES COUNTERSINKS CARBIDE TOOLS TOOL BITS SPECIAL TOOLS

"Makers of Fine Tools Since 1848"

WHITMAN & BARNES
40105 PLYMOUTH RD. • PLYMOUTH, MICH.
NEW YORK • CHICAGO
LOS ANGELES • HOUSTON • ATLANTA

TEACH AN APPRECIATION FOR FINE TOOLS

Chicago-Latrobe, makers of fine drills, reamers, and related cutting tools, compliments the American educational system for the fine job it is doing in preparing young people for useful places in industry. As an aid to the many instructors, Chicago-Latrobe offers two pieces of useful literature:

Pocket, Desk, or Wall Chart of Decimal Equivalents

Book on the CARE of DRILLS and REAMERS

Chicago-Latrobe top quality is widely recognized. The complete line is handled locally by industrial Distributors.

DOUBLE CIRCLE DRILLS

CHICAGO-LATROBE
430 W. ONTARIO ST. CHICAGO 10

Cincinnati Lathe & Tool Co.
DeWalt Products Corp.
Dixon, Inc., William
Millers Falls Co.
North Bros. Mfg. Co.
Patterson Bros.
Stanley Electric Tools
Whitman & Barnes

CHUCKS, INDEPENDENT, Universal Combination
Brodhead-Garrett Co.
Boice-Crane Company
L. W. Chuck Co.
Patterson Bros.
South Bend Lathe Works

CIRCULAR-SAW BENCHES
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Shopmaster, Inc.
Walker-Turner Co., Inc.
Yates-American Machine Co.

CIRCULAR SAWS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Cutris Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Shopsmith
Walker-Turner Div.

CLAMPS, ADJUSTABLE, BAR
Adjustable Clamp Co.
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Lufkin Rule Co.
Patterson Bros.
Starrett Co., L. S.
Williams Co., J. H.
X-acto Crescent Products Co., Inc.

CLAMPS, CARRIAGE, SCREW, WELDERS
Adjustable Clamp Co.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Patterson Bros.
Williams Co., J. H.
Wilton Tool Mfg. Co., Inc.

CLEANERS, FILE
Dixon, Inc., Wm.

COMBINATION SQUARES
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Lufkin Rule Co.
Millers Falls Co.
Patterson Bros.
Stanley Tools
Starrett Co., The L. S.

COMPOSING STICKS
Rouse & Co., H. B.

CONTROLLERS, ELECTRIC
Electric Hotpack Co., Inc.
Weston Electric Instrument Co.

COPING SAW BLADES
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., William
Millers Falls Co.
Patterson Bros.

COPING SAWS
Brodhead-Garrett Co.
Dixon, Inc., William
Millers Falls Co.
Patterson Bros.

COPPER HOVELTIES
Stewart Clay Co.

COUNTERSINKS
Brodhead-Garrett Co.
Chicago Latrobe Twist Drill Works
Greenlee Tool Co.
Millers Falls Co.
North Bros. Mfg. Co.
Patterson Bros.
Stanley Tools
Whitman & Barnes

CURVES, IRREGULAR
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
DeWalt Products Corp.
Duro Metal Products Co.
Engineering Sales Company
Keuffel & Esser
Post Company, Frederick
Weber Company, F.

CUT-OFF SAWS
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Yates-American Machine Co.

CUTTER HEADS
Brodhead-Garrett Co.
Delta Mfg. Co.
De Walt Products Corp.
Patterson Bros.
Yates-American Machine Co.

CUTTER & TOOL GRINDERS
Blount Co., J. G.
Boice-Crane Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
LeBlond Machine and Tool Co., R. K.
Patterson Bros.

CYLINDER PRINTING PRESS
Challenge Machinery Co.

D

DADO HEADS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Curtis Mfg. Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Shopsmith
Walker-Turner Co., Inc.
Yates-American Machine Co.

DESKS, Instructors'
Parent Metal Products, Inc.

DIVIDING HEAD
L. W. Chuck Co.
Nichols-Morris Corp.

DO IT YOURSELF PROJECTS
Stueck, Inc., W. Whitney
Veneer Lumber & Plywood Co.

DOWEL POINTERS
Brodhead-Garrett Co.
Patterson Bros.

DOWELING JIGS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

DRAFTING MACHINES
Universal Drafting Machine Corp.

DRAFTING PAPER
General Finishes Sales & Service Co.

DRAFTING PENS
Alvin Company
Berger Scientific Supplies, Inc.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Gramercy Import Co., Inc.
Keuffel & Esser
Post Company, Frederick
V & E Mfg. Company
Weber Co., F.

DRAFTING TABLES
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Engineering Mfg. Co.
Hamilton Mfg. Co.
Keuffel & Esser
Parent Metal Products, Inc.
Post Company, Frederick
Stacor Equipment Co.
Stoner Wood Products Co.
Tolerton Co.
Weber Company, F.

DRAFTSMEN'S INSTRUMENTS
Alvin Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Gramercy Import Co., Inc.
Keuffel & Esser
Post Company, Frederick
V & E Mfg. Company
Weber Company, F.

DRAWING INSTRUMENT REPAIR PARTS
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Engineering Mfg. Co.
Gramercy Import Co., Inc.
Post Co., Frederick
V & E Mfg. Company
Weber Co., F.

DRAWING OUTFITS
Alvin Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Engineering Mfg. Co.
Keuffel & Esser
Post Company, Frederick
V & E Mfg. Company
Weber Co., F.

DRAWING PAPER IN ROLLS AND SHEETS
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Keuffel & Esser
Post Company, Frederick
Weber Co., F.

DRILL PRESSES
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
Shopsmith
South Bend Lathe Works

DRILL SHARPENERS
Atlas Press Co.
Brodhead-Garrett Co.
Patterson Bros.
Snap-On Tools, Inc.

DRILL STANDS, BENCH, POST, PEDESTAL
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Dixon, Inc., Wm.
Duro Metal Products Co.
Millers Falls Co.
Patterson Bros.
Snap-On Tools, Inc.
South Bend Lathe Works
Stanley Electric Tools
Whitman & Barnes

DRILLING MACHINES, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Millers Falls Co.
Patterson Bros.
Skil Corporation
Snap-On Tools, Inc.
Stanley Electric Tools

DRILLING MACHINES, RADIAL
Boice-Crane Co.
Walker-Turner Div.

DRILLS
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Snap-On Tools, Inc.
Stanley Electric Tool Div.
Whitman & Barnes

DRILLS, BENCH AND FLOOR, HIGH SPEED
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
Duro Metal Products Co.
Millers Falls Co.
Patterson Bros.
South Bend Lathe Works
Walker-Turner Co.

DRILLS, BREAST
Brodhead-Garrett Co.
Millers Falls Co.
North Bros. Mfg. Co.
Patterson Bros.
Stanley Tools

DRILLS, CARVING FOR PLASTICS
Brodhead-Garrett Co.
Elbar Products
Foredom Electric Co.
Patterson Bros.

DRILLS, HAND
Chicago Wheel & Mfg. Co.
Dixon, Inc., William
Millers Falls Co.
North Brothers Mfg. Co.
Patterson Bros.
Stanley Tools
X-acto, Inc.

DUPLICATORS, MIMEOGRAPH
Dick Company, A. B.

DUST COLLECTORS
American Air Filter Co.
Kindt-Collins Co.
Patterson Bros.

DYNAMOMETERS, ELECTRIC
Brodhead-Garrett Co.

E

ELECTRIC WELDING EQUIPMENT & SUPPLIES
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.

ELECTRIC EQUIPMENT, WIRE & SUPPLIES
Brodhead-Garrett Co.
Gearon Company, The
Kaasel & Co., L. H.
Ohmite Mfg. Co.
Telephone Engineering Co.

ELECTRIC GENERATORS
General Electric Co.
Standard Electric Time Co.

ELECTRIC MOTORS
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Patterson Bros.

ELECTRIC SOLDERING IRONS
Brodhead-Garrett Co.
Dixon, Inc., William
Handcrafters, The
Patterson Bros.
Snap-On Tools, Inc.
Stanley Tools

ELECTRICAL INSTRUMENTS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Weston Electric Instrument Co.

ELECTRICITY — Experimental Kits for Teaching
Universal Scientific Co., Inc.

ELECTROTYPES
Badger-American Electrotype Co.

ENAMELING ON COPPER SUPPLIES
Stewart Clay Co.

ENGRAVERS' TOOLS AND SUPPLIES
Dixon, Inc., William
Metal Craft Supply Co.
Metal Goods Corp.
Plasticast Co.

ENVELOPES
Western States Envelope Co.

EXHAUST FANS
American Air Filter Co.

EXPOSURE METERS
Weston Electric Instrument Corp.

F

FIBERGLAS FABRICS
Castolite Co., The

FILES AND RASPS
Brodhead-Garrett Co.
Dixon, Inc., William
Foley Mfg. Co.
Nicholson File Co.
Patterson Bros.
Plumb, Inc., Fayette R.
Simonds Saw & Steel Co.
Snap-On Tools, Inc.
X-acto, Inc.

FILING CASES
Elliott Co., B. K.
Hamilton Mfg. Co.
Parent Metal Products, Inc.
Weber Co., F.

FILING MACHINES
Boice-Crane Co.
Foley Mfg. Co.

FILMS, INDUSTRIAL TRAINING, TEACHING, ETC.
Aluminum Co. of America
Delco-Remy Div., General Motors Corp.
Eastman Kodak Co.
Jam Handy Organization
South Bend Lathe Works
Starrett Co., The L. S.
United World Films, Inc.

FINISHING MATERIALS
Brodhead-Garrett Co.
Delkote, Inc.
General Finishes Sales & Service Co.
Patterson Bros.
Upholstery Supply Co.

FIRE BRICK AND CEMENT
Electric Hotpack Co., Inc.
Plasticast Co.
Stewart Clay Co.

FIRE CLAY
Brodhead-Garrett Co.
Plasticast Co.
Stewart Clay Co.
Western Materials Co.

FISH GLUE, LIQUID
Rogers Isinglas & Glue Co.

FLASKS
Brodhead-Garrett Co.
Sterling Wheelbarrow Co.
Western Materials Co.

FLEXIBLE SHAFT AND MOTOR OUTFITS
Brodhead-Garrett Co.
Dixon, Inc., William
Foredom Electric Co.
Patterson Bros.
Walker-Turner Co., Inc.

FLEXIBLE STEEL TAPE RULES
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Patterson Bros.
Weber Co., F.

FLOCK EQUIPMENT AND SUPPLIES
Brodhead-Garrett Co.
DonJer Products
Stewart Clay Co.

FLUX, SOLDERING
Brodhead-Garrett Co.
Dixon, Inc., William
Johnson Gas Appliance Co.
Kester Solder Co.
Patterson Bros.
Ruby Chemical Co.

FOLDING RULES
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Lufkin Rule Co.
Patterson Bros.
Stanley Tools

FORGE TOOLS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

FORGES, Annealing & Melting
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.
Sunbeam Corp.

FORGES, GAS
American Gas Furnace Co.
Brodhead-Garrett Co.
Patterson Bros.
Sunbeam Corp.
Western Material Co.

FOUNDRY EQUIPMENT & SUPPLIES
Brodhead-Garrett Co.
Curtis Mfg. Co.
Sterling Wheelbarrow Co.
Western Materials Co.

FREQUENCY METERS, Portable and Switchboard
Brodhead-Garrett Co.
Weston Electric Instrument Co.

FURNACES, Annealing, Case-Hardening, Forging, Heat Treating, Metal Melting, Soldering, Tempering
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Electric Hotpack Co., Inc.
Johnson Gas Appliance Co.

PROTEXEM

VAPOR ACTION BRUSH CONDITIONER

A MODERN SCIENTIFIC METHOD for storing, preserving and reclaiming brushes.
VAPOR ACTION keeps **NATURAL BRISTLE and NYLON** brushes ready to use. Reclaims HARD-AS-ROCK brushes.
BRUSHES HANG IN VAPOR not in liquid. VAPOR penetrates the paint in brushes and keeps them soft. **BRUSHES ALWAYS READY** to use.

SAVES VALUABLE CLASS TIME

ASK ABOUT OUR 30 DAY FREE TRIAL

Write for complete information

Wisconsin Laboratories, Inc.

Dept. IA Dousman, Wisconsin

CERAMIC and SCULPTURE SUPPLIES

SINCE 1867

STEWART'S has been your best source of supplies for sculpture and ceramic materials and equipment. Today as in the past, we stand ready to serve you who use our products with the benefits of our long experience.

• Ceramic Kilns • Glazes • Clay Slip Stains • Tools • Potters Wheels • Kiln Furniture • Selfire Glazes • Underglaze Colors • Overglaze Colors • Pastolene • Plasticum • Italian Modeling Clay • Sculptors Tools • Armatures • Metal Enameling Kilns • Metal Enamels • Copper Forms • Enameling Tools

Write today enclosing 25 cents for mailing & handling, for your copy of our catalogue covering sculpture, ceramic & enameling supplies.

STEWART CLAY CO., INC.

Dept. 25

133 Mulberry Street New York 13, N. Y.

SHOP EQUIPMENT NEWS

(Continued from page 98A)

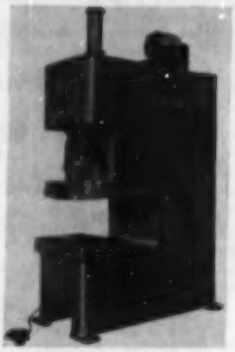
and control section unsurpassed even in units sold at much higher prices.

These EICO Kits, come with complete easy-to-follow step-by-step instructions, and they are backed up with the EICO Make-Good Guarantee on components, instructions, performance and lifetime service and calibration guarantee.

(For Convenience Circle Index Code 0312)

BULLETIN DESCRIBES DEEP THROAT PRESSES

The new line of Niagara Deep Throat Presses is introduced in Bulletin 61C by Niagara Machine and Tool Works. Description and specifications are given for the complete range of 22- to 150-ton capacity presses which feature a Niagara-developed front-to-back crankshaft design and enclosed driving mechanism. Also fully described and illustrated



New Style Line Series C Deep Throat Press

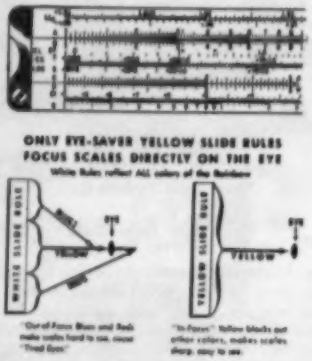
in this 26-page book are other press features including electro-pneumatic clutch and air-releasing brake, box-type welded steel frames, adjustable air counterbalance, automatic lubrication, operating controls, and press accessories.

(For Convenience Circle Index Code 0313)

GREEN-YELLOW EYE-SAVER SLIDE RULE

Pickett & Eckel, Inc., are producing a new light-alloy, eye-saver slide rule made in green-yellow, eliminating violet and red rays which focus in front of and behind the retina.

(Continued on page 102A)


ONLY EYE-SAVER YELLOW SLIDE RULES FOCUS SCALES DIRECTLY ON THE EYE
White Rules reflect ALL colors of the Rainbow
WHITE SLIDE RULE
YELLOW
YELLOW SLIDE RULE
YELLOW

Green-Yellow Eye-Saver Slide Rule

These Popular Texts on

GAS WELDING AND CUTTING

help students learn faster

Plenty of KNOW-HOW
Plenty of SHOW-HOW

Welding and Cutting Manual

A practical, how-to-do-it book for the beginner who wants to *learn by doing*. Over 200 pages and 600 step-by-step pictures of simplified procedures for handling everyday jobs. 6 x 9 inches; only $1.80 a copy.

The Oxy-Acetylene Handbook

This 600-page handbook for the advanced student is the most comprehensive reference of oxy-acetylene welding and cutting procedures available at any price. Over 400 how-to-do-it illustrations. 6 x 9 inches; only $2.70 a copy.

LINDE AIR PRODUCTS COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

Molding and Core Sands • Molders' Tools • Riddles • Flasks • Crucibles Brass, Bronze & Aluminum Pigs Asbestos Gloves & Leggings Goggles, etc.

•

FAST MELTING "SPEEDY MELT" FURNACES

4 Sizes Gas Fired

•

Also Heat Treating Furnaces, Electric Ovens, Ceramic & Enameling Furnaces and "Speedy Forge" Gas Forges

Send us a list of your requirements. We'll do the rest.

•

ASK FOR LITERATURE

Western Materials Company
Equipment Division
39 South LaSalle Street
Chicago 3, Illinois

Kindt-Collins Co.
Patterson Bros.
Plasticast Co.
Sunbeam Corp.
Western Materials Co.

FURNITURE FOR SHOP PROJECTS
Phillips Furniture Co.

G

GALVANOMETERS
Brodhead-Garrett Co.
Weston Electric Instrument Co.

GAUGES, BIT, CABINET, RULE AND SQUARE
Brodhead-Garrett Co.
Millers Falls Co.
Patterson Bros.
Stanley Tools

GAUGES, CALIPER
Brodhead-Garrett Co.
Dixon, Inc., William
Lufkin Rule Co.
Patterson Bros.
Starrett Co., L. S.

GAUGES, MARKING, THICKNESS AND THREAD
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Duro Metal Products Co.
Lufkin Rule Co.
Patterson Bros.
Starrett Co., L. S.

GENERATOR TEST BENCHES
Standard Electric Time Co.

GLASS CUTTER
Brodhead-Garrett Co.
Lufkin Rule Co.
Millers Falls Co.
Patterson Bros.

GLAZING TOOLS
Brodhead-Garrett Co.
Plasticast Co.

GLUE
Bordon Co., The
Brodhead-Garrett Co.
Elliott Co., B. K.
General Finishes Sales & Service Co.
Higgins Ink Co., Inc.
Kindt-Collins Co.
Patterson Bros.
Paxton Lumber Co., Frank
Plasticast Co.
Rogers Isinglass & Glue Co.

GLUE POTS, ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Kindt-Collins Co.
Oliver Machinery Co.
Patterson Bros.
Plasticast Co.
Sta-Warm Elec. Co.

GRINDERS AND BUFFERS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Blount Co., J. G.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Millers Falls Co.
Patterson Bros.
Plasticast Co.
Stanley Electric Tools
Walker-Turner Div.

GRINDERS, BENCH, PEDESTAL TYPE
Atlas Press Co.
Black & Decker Mfg. Co.
Blount Co., J. G.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Millers Falls Co.
Mummert-Dixon Co.
Patterson Bros.
Queen City Machine Tool Co.
Skil Corporation
Snap-On Tools, Inc.
Stanley Electric Tools
Walker-Turner Div.

GRINDERS, OILSTONE
Atlas Press Co.
Brodhead-Garrett Co.
Mummert-Dixon Co.
Oliver Machinery Co.

GRINDERS, TOOL ROOM, SURFACE
Atlas Press Co.
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Dumore Co., The
Millers Falls Co.
Skil Corporation
South Bend Lathe Works
Stanley Electric Tool Div

GRINDING MACHINES Plain, Universal, Centerless
Atlas Press Co.
Blount Co., J. G.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Mach. Co.

GRINDING WHEELS
Atlas Press Co.
Blount Co., J. G.
Brodhead-Garrett Co.
Cincinnati Milling Machine Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Patterson Bros.
Plasticast Co.
Snap-On Tools, Inc.
Stanley Electric Tool Div.

H

HACKSAW BLADES
Brodhead-Garrett Co.
Duro Metal Products Co.
Millers Falls Co.
Patterson Bros.
Simonds Saw & Steel Co.
Snap-On Tools, Inc.
Starrett Co., The L. S.

HACKSAWS, Portable, Electric, Power
Brodhead-Garrett Co.
Duro Metal Products Co.
Millers Falls Co.
Misener Mfg. Corp.
Patterson Bros.
Snap-On Tools, Inc.

HAMMERS
Brodhead-Garrett Co.
Cunningham, M. E.
Dixon, Inc., William
Duro Metal Products Co.
Millers Falls Co.
Patterson Bros.
Plumb, Inc., Fayette R.
Snap-On Tools, Inc.
Stanley Tools
Williams Co., J. H.
X-acto, Inc.

HAMMERS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Mall Tool Co.
Millers Falls Co.
Stanley Electric Tools

HAND SAWS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Millers Falls Co.
Patterson Bros.
Stanley Electric Tools

HAND SCREWS
Adjustable Clamp Co.
Brodhead-Garrett Co.
Patterson Bros.

HANDICRAFT SUPPLIES
Berkroy Products, Inc.
Brodhead-Garrett Co.
Castolite Co., The
Craftools, Inc.
Craftsman Supply House
Craftsman Wood Service Co.
Dixon, Inc., William
Gearon Company, The
General Finishes Sales & Service Co.
Hammett Co., J. L.
Hubbell Metals, Inc.
Metal Goods Corp.
Patterson Bros.
Plasticast Co.
Veneer Lumber & Plywood Co.
X-acto Crescent Products Co., Inc.

HARDIES
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

HEAT-FLOW METERS
Brodhead-Garrett Co.
Weston Electric Instrument Corp.

HEATING ELEMENTS, ELECTRIC
Brodhead-Garrett Co.
Electric Hotpack Company, Inc.

HEAT-TREATING EQUIPMENT
American Gas Furnace Co.
Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Johnson Gas Appliance Co.
Patterson Bros.
Sunbeam Corp.
Western Materials Co.

I

IMPACT TOOL, Portable Electric
Millers Falls Co.

IMPORTED WOODWORKING TOOLS
Mittermeier, Frank

IMPORTERS' GERMAN DRAWING INSTRUMENTS
Gramercy Import Co., Inc.

INDICATING INSTRUMENTS, ELECTRIC
Weston Electric Instrument Co.

INDUSTRIAL ARTS AWARDS
Ford Motor Co.

INK REMOVERS
Dietzgen Co., Eugene
Higgins Ink Co., Inc.
Weber Company, F.

INKS, DRAWING AND COLORED
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Higgins Ink Co., Inc.
Keuffel & Esser
Post Company, Frederick
Weber Company, F.

INKS, PRINTING
Brodhead-Garrett Co.
Driscoll & Co., Martin

INTERCOMMUNICATION SETS
Telephone Engineering Co.

J

JEWELERS' TOOLS, EQUIPMENT AND SUPPLIES
Bergen Arts & Crafts
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Dremel Mfg. Co.
Foredom Electric Co.
Jewelry Craft Supply
Patterson Bros.
Plasticast Co.
Wilton Tool Mfg. Co., Inc.

JIG SAWS
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Dalton Mfg. Co.
Delta Mfg. Co.
DeWalt Products Co.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Walker-Turner Co., Inc.
X-acto Crescent Products
Yates-American Machine Co.

JOINTERS, BENCH, HAND
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Duro Metal Products Co.
Kindt-Collins Co.
Northfield Foundry & Mach. Co.
Oliver Machinery Co.
Patterson Bros.
Walker-Turner Co., Inc.
Yates-American Machine Co.

K

KEENE CEMENT
Brodhead-Garrett Co.
Plasticast Co.

KILNS
Brodhead-Garrett Co.
Craftools, Inc.
Electric Hotpack Company, Inc.
Plasticast Co.
Western Materials Co.

KNIVES, PAPER CUTTER
Brodhead-Garrett Co.
Millers Falls Co.
Simonds Saw & Steel Co.

KNIVES, BAND, MACHINE
Brodhead-Garrett Co.
Oliver Machinery Co.
Patterson Bros.
Simonds Saw & Steel Co.
Yates-American Machine Co.

KNIVES, HOBBY
Brodhead-Garrett Co.
Dixon, Inc., William
Elliott Co., B. K.

KNIVES, SLOYD
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

KNOCK-DOWN FURNITURE
Bedford Lumber Co.
Brodhead-Garrett Co.
Giles & Kendall

KNURLS
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
Williams & Co., J. H.

L

LABORATORY STANDARD INSTRUMENTS
Electric Hotpack Co., Inc.
Weston Electric Instrument Co.

LAMP PARTS & SUPPLIES
Kassel & Co., L. H.
Plasticast Co.

LAMPS, MINIATURE
Brodhead-Garrett Co.
General Electric Co.

LATEX MOLDING COMPOUNDS
Castolite Co., The
Plasticast Co.
Stewart Clay Co.

LATHE ATTACHMENTS
Armstrong Bros. Tool Co.
Atlas Press Co.
Blount Co., J. G.
Brodhead-Garrett Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Patterson Bros.
Plasticast Co.
Pootatuck Corp.
Sheldon Machine Co., Inc.
South Bend Lathe Works
Walker-Turner Div.
Williams Co., J. H.

LATHES, Bench, Metal Working
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Duro Metal Products Co.
LeBlond Machine Tool Co., R. K.
Logan Engineering Co.
Patterson Bros.
Plasticast Co.
Pootatuck Corp.
Sheldon Machine Co., Inc.
South Bend Lathe Works

LATHES, GAP BED
Blount Co., J. G.
Boice-Crane Company
Brodhead-Garrett Co.
Duro Metal Products Corp.
LeBlond Machine Tool Co., Inc.
Walker-Turner Co., Inc.

LATHES, SMALL PRECISION
Atlas Press Co.
Brodhead-Garrett Co.
DeWalt Products Corp.
Plasticast Co.
South Bend Lathe Works
Sheldon Machine Co., Inc.

LATHES, SPINNING
Atlas Press Co.
Blount Co., OJ. G.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., William
Oliver Machinery Co.
Patterson Bros.
Plasticast Co.
Sheldon Machine Co., Inc.
Walker-Turner Co., Inc.

LATHES, WOODWORKING
Atlas Press Co.
Blount Co., J. G.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Mfg. Co.
Duro Metal Products Co.
Kindt-Collins Co.
Oliver Machinery Co.
Patterson Bros.
Shopsmith
Walker-Turner Co., Inc.
Yates-American Machine Co.

LAYOUT SURFACE PLATES
Challenge Machinery Co.

LEAD AND RULE CUTTERS
Brodhead-Garrett Co.
Rouse Co., H. B.

LEAD HOLDERS, DRAFTING
Eagle Pencil Co.

LEADS, DRAFTING
Eagle Pencil Co.
X-acto Crescent Prod. Co.

LEATHER
Brodhead-Garrett Co.
Crown Leather Co.
Larson Co., J. C.
Plasticast Co.
Sax Brothers Co.

LEATHER WORKING TOOLS AND SUPPLIES
Brodhead-Garrett Co.
Crown Leather Co.
Dixon, Inc., William
Indianhead Archery & Mfg. Co.
Larson Co., J. C.
Osborn Bros.
Plasticast Co.
Sax Brothers Co.
X-acto Crescent Prod. Co.

LETTERS AND FIGURES FOR STAMPING METALS
Brodhead-Garrett Co.
Cunningham Co., M. E.
Dixon, Inc., William
Millers Falls Co.
Patterson Bros.
Plasticast Co.

LEVELS
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Lufkin Rule Co.
Millers Falls Co.
Patterson Bros.
South Bend Lathe Works
Stanley Tools
Starrett Co., L. S.

LINOLEUM AND RUBBER BLOCKS AND ENGRAVING TOOLS
Brodhead-Garrett Co.
Dixon, Inc., William
Dremel Mfg. Co.
Millers Falls Co.
Rembrandt Graphic Arts Co., Inc.

LINOLEUM, BLOCK CUTTING AND PRINTING TOOLS AND SUPPLIES
Brodhead-Garrett Co.
Dixon, Inc., William
Elliott Co., B. K.
LeisureCrafts
Plasticast Co.
Webs Co., F.
X-acto Crescent Products Co., Inc.

LOOM CLAMPS
Brodhead-Garrett Co.

LOOMS
Brodhead-Garrett Co.
Hammett Co., J. L.

LUMBER
Brodhead-Garrett Co.
Cotton-Hanlon, Inc.
Craftsman Wood Service Co.
Foley Lumber Co., T. A.
Giles & Kendall
Hardwood Corp. of America
Kindt-Collins Co.
Paxton Lumber Co., Frank
Veneer Lumber & Plywood Co.

LUMBER — HARDWOODS
Brodhead-Garrett Co.
Cotton-Hanlon, Inc.
Hardwood Corp. of America
Paxton Lumber Co., Frank
Veneer Lumber & Plywood Co.

CUTS ANY ARC of a CIRCLE

BORES AT ANY ANGLE

FORSTNER

AUGER BIT

This bit has no center point but is guided by its circular rim. Consequently, you can bore at any angle, cutting any arc of a circle, even against the grain and into knots. It leaves a true polished surface. It is available in brace shanks from ¼" to 2", and in machine shanks from ¼" to 3". Send for name of nearest distributor, and FREE descriptive literature explaining the jobs you can do and how to do them with this valuable tool. Simply write to . . .

The Connecticut Valley Mfg. Co.
Centerbrook 4, Conn.

Teach Modern Wood Finishing with the famous SEALACELL PROCESS

The "Wipe-on" Finish that

- Eliminates dust troubles
- Requires no brushes
- Protects and preserves wood
- Needs no sanding between coats

SPECIAL OFFER

Our new pocket size Sealacell Penetrating Process Wood Finishing Manual is free on request. Additional student copies sent free with your order of materials.

GENERAL FINISHES SALES and SERVICE CO.
1548 West Bruce St. Milwaukee 16, Wis.

SHOP EQUIPMENT NEWS

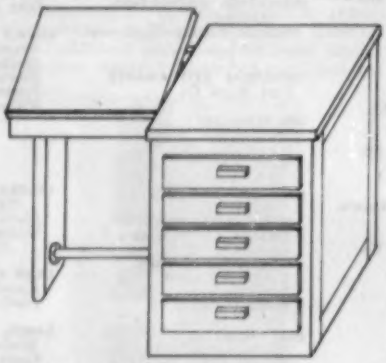
(Continued from page 100A)

Green-yellow shade coincides with optimum sight point of the spectrum, cuts eyestrain, blurring, and errors in reading calibrations. Noncorrosive, nonrusting, metal construction eliminates warping, swelling, and binding. Now made in 6- and 10-in. Trig, Log-Log standard rules, or in rules made to special order. Free catalog on request.

(For Convenience Circle Index Code 0314)

NEW DRAFTING TABLE

Stoner Wood Products Company are now marketing a de luxe drafting table with five drawers, each of which stores the complete drafting kit including a 24-in. T square and 18 by 24-in. drawing board. The top is



New Stoner Drafting Table

furnished with satin finish formica over 1-in. plywood. Master-keyed pin-tumbler locks are on each drawer. One half of the top remains flat for books and instruments.

(For Convenience Circle Index Code 0315)

HOBART RECTIFIER WELDER

A new 300-ampere d.c. selenium rectifier type arc welder with Remote Control is being announced by Hobart Brothers Co.

Hobart Rectifier Welder

The 5-range control switch of this welder provides coarse adjustment with generous overlap between ranges to provide dual control. The rheostat, which can be removed for remote control, provides continuous control by adjusting the direct current through the control coils. These controls provide a wide welding current range of 35 to 425 amperes for use with a variety of electrode sizes for repair, maintenance, and production welding.

(Continued on page 104A)

NEW BOOKS for the PRINTING TRADES

Printing LAYOUT and Design

Over 350 pencil layouts showing good and poor practice. Color used to show use of printing color wheel, harmonies and use of color.

$4.75 IN COLOR CLOTHBOUND

Practical Problems in Mathematics Printing Trades

Here is a simply and clearly written TEXT-WORKBOOK. Using a sound instructional format, it provides material in mathematics designed for the practical requirements of those in the printing trades.

Plastic NET $1.80
Ans. Book NET 1.00

WRITE NOW for prompt shipment of your Examination Copies

DELMAR PUBLISHERS
ALBANY 5, NEW YORK

STOP LOOKING AROUND

BERGEN HAS EVERYTHING!

for JEWELRY MAKING and COPPER ENAMELING

BERGEN offers the world's largest selection of supplies for every JEWELRY and ENAMELING need. BERGEN offers earwires, pinbacks, cuff links, etc., in 5 different finishes. Over 300 shapes and copper blanks for COPPER ENAMELING, dozens of open copper bowls, ashtrays and novelties, more than 75 different enamels. Yes, BERGEN has EVERYTHING! Send for your copy of the latest and largest catalog — it's FREE.

Write Dept. IAC

Bergen Arts & Crafts

173 BEECH STREET • HACKENSACK, N. J.

M

MACHINE KNIVES, JOINTER AND SURFACER
Boice-Crane Company
Brodhead-Garrett Co.
DeWalt Products Corp.
Oliver Machinery Co.
Patterson Bros.
Yates-American Machine Co.

MACHINE LIGHTS
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
South Bend Lathe Works
Walker-Turner Div.

MACHINE TOOL DRIVES
Patterson Bros.
Williams Co., J. H.

MACHINISTS' TOOLS
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
DoAll Co.
Lufkin Rule Co.
Millers Falls Co.
Patterson Bros.
Stanley Tools
Starrett Co., L. S.

MALLETS, HICKORY, RUBBER, RAWHIDE
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Western Materials Co.

MANUAL-TRAINING TOOLS AND SUPPLIES
Berkroy Products, Inc.
Brodhead-Garrett Co.
Cincinnati Tool Co.
Connecticut Valley Mfg. Co.
Craftsman Wood Service Co.
Dixon, Inc., William
Greenlee Tool Co.
Lufkin Rule Co.
Millers Falls Co.
North Bros. Mfg. Co.
Patterson Bros.
Plasticast Co.
Stanley Tools
Starrett Co., The L. S.

MANUAL-TRAINING VISES
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Morgan Vise Co.
North Bros. Mfg. Co.
Parent Metal Products, Inc.
Patterson Bros.
Sheldon & Co., E. H.

MEASURING INSTRUMENTS, ELECTRIC
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Weston Electric Instrument Co.

MELTING POT EQUIPMENT
American Gas Furnace Co.
Brodhead-Garrett Co.
Johnson Gas Appliance Co.
Patterson Bros.
Plasticast Co.
Sunbeam Corp.

METAL CRAFT TOOLS AND SUPPLIES
Berkroy Products, Inc.
Brodhead-Garrett Co.
Dixon, Inc., William
Duro Metal Products Co.
Formit
Lufkin Rule Co.
Metal Crafts Supply Co.
Metal Goods Corp.
Patterson Bros.
Plasticast Co.
X-acto Crescent Products Co., Inc.

METAL CUTTING SAWS
Boice-Crane Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., William
Kalamazoo Tank & Silo Co.
Patterson Bros.
Racine Tool & Mach. Co.
Stanley Electric Tool Div.

METAL SHEARS, ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Millers Falls Co.
O'Neil Irwin Mfg. Co.
Patterson Bros.
Skil Corporation
Stanley Electric Tools

METAL SPINNING EQUIPMENT
Blount, J. G.
Boice-Crane Co.
Brodhead-Garrett Co.
Dixon, Inc., Wm.
Patterson Bros.

METALS FOR HANDICRAFT
Brodhead-Garrett Co.
Dixon, Inc., William
Formit
Metal Goods Corp.
Patterson Bros.
Plasticast Co.

METALS, SHEET
Brodhead-Garrett Co.
Dixon, Inc., William
Metal Crafts Supply Co.
Metal Goods Corp.
Patterson Bros.
Plasticast Co.

METRIC SCALES, FLAT
Dietzgen Co., Eugene
Post Company, Frederick

MICROMETERS
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Lufkin Rule Co.
Millers Falls Co.
Patterson Bros.
Snap-On Tools, Inc.
Starrett Co., L. S.
Weston Electric Instrument Co.

MICROFARAD METERS
Weston Electric Instrument Co.

MILLING ATTACHMENTS
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
Pootatuck Corp.
South Bend Lathe Works
Sheldon Machine Co., Inc.
Williams & Co., J. H.

MILLING MACHINES
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Lathe & Tool Co.
Cincinnati Milling Mach. Co.
Kearney & Trecker Corp.
Logan Engineering Co.
Nichols-Morris Corp.
Patterson Bros.
Pootatuck Corp.
Rouse & Co., H. B.
Sheldon Machine Co., Inc.

MILLING MACHINE VISES
Wilton Tool Mfg. Co., Inc.

MITER BOXES
Brodhead-Garrett Co.
Millers Falls Co.
Patterson Bros.
Stanley Tools

MITERING MACHINES, HAND AND POWER (Printing)
Brodhead-Garrett Co.
DeWalt Products Corp.
Patterson Bros.
Pootatuck Corp.
Rouse Co., H. B.

MODELING TOOLS
Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Elliott Co., B. K.
Stewart Clay Co.

MORTISERS
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Greenlee Tool Co.
Oliver Machinery Co.
Patterson Bros.
Powermatic Machine Co.
South Bend Lathe Works
Walker-Turner Co., The
Yates-American Machine Co.

MOTOR GENERATOR SETS
Brodhead-Garrett Co.

MOTORS, ELECTRIC
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Heston & Andersen
Patterson Bros.
Stanley Electric Tool Div.

MOTORS, ELECTRIC — Experimental Type
Universal Scientific Co., Inc.

N

NIPPERS, Cutting, Jewelers'
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Starrett Co., L. S.

NOTCHERS
O'Neill Irwin Mfg. Co.

O

OHMMETERS, PORTABLE
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Weston Electric Instrument Co.

OILSTONE TOOL GRINDER, Power
Brodhead-Garrett Co.
Mummert-Dixon Co.
Oliver Machinery Co.
Patterson Bros.
Plasticast Co.

OVEN, PLASTIC PREHEATING
Electric Hotpack Co., Inc.
Plasticast Co.

OZALID PAPER
Dietzgen Co., Eugene

P

PAGE FRAMES
Rouse Co., H. B.

PAINT BRUSH PROTECTOR
Wisconsin Laboratories, Inc.

PAINTS AND VARNISHES
Brodhead-Garrett Co.
Delkote, Inc.
General Finishes Sales & Service Co.
Patterson Bros.
Pittsburgh Plate Glass Co.
Plasticast Co.

PAPER, CLOTH-BACKED
General Finishes Sales & Service Co.
Post Company, Frederick

PAPER CUTTERS
Brodhead-Garrett Co.
Chandler & Price
Elliott Co., B. K.
Keuffel & Esser
Post Co., Frederick

PAPER, DRAWING AND TRACING
Dietzgen Co., Eugene
Eastern Handicraft Supply Co.
Elliott Co., B. K.
Keuffel & Esser
Post Company, Frederick
Weber Company, F.

PASTE
Dietzgen Co., Eugene
Elliott Co., B. K.
Higgins Ink Co., Inc.
Plasticast Co.
Ruby Chemical Co.

PATTERN LUMBER & SHOP SUPPLIES
Kindt-Collins Co.

PENCILS, PLAIN, COLORED, DRAWING, WORKING
American Lead Pencil Co., Inc.
Dietzgen Co., Eugene
Eagle Pencil Company
Elliott Co., B. K.
Keuffel & Esser
Post Company, Frederick
Weber Company, F.

PENS, LETTERING, INK SHADING
Dietzgen Co., Eugene
Elliott Co., B. K.
Keuffel & Esser
Plasticast Co.
Post Company, Frederick
Weber Co., F.

PEWTER
Dixon, Inc., William
Metal Craft Supply Co.
Patterson Bros.

PHASE ANGLE METERS
Weston Electric Instrument Co.

PLANERS AND SURFACERS (WOOD)
Boice-Crane Company
Craftsman Wood Service Co.
Delta Mfg. Co.
DeWalt Products Corp.
Kindt-Collins Co.
Northfield Foundry & Mach. Co.
Oliver Machinery Co.
Parks Woodworking Mach. Co.
Patterson Bros.
Powermatic Machine Co.
Yates-American Machine Co.

PLANES, HAND
Millers Falls Co.
Patterson Bros.
Stanley Tools

PLANES, PORTABLE, ELECTRIC
Patterson Bros.
Stanley Electric Tool Div.

PLASTICS
Cadillac Plastics Co.
Castolite Co., The
D. W. Cope
Craftsman Supply House
McClarin Plastics
Paxton Lumber Co., Frank
Plastic Parts & Sales
Plasticast Co.
Duro Metal Products Co.
Lufkin Rule Co.
Millers Falls Co.
Patterson Bros.
Stanley Tools
Starrett Co., The L. S.
Williams & Co., J. H.

PLASTICS — WOOD MATERIALS, HEAT TREATMENT
Brodhead-Garrett Co.
Cadillac Plastic Co.
Electric Hotpack Company, Inc.
Plasticast Co.

PLATEN PRESSES
Dake Engine Co.

PLATES — SURFACE, LAYOUT, BENCH
Challenge Machinery Co.
Dixon, Inc., William

PLIERS
Dixon, Inc., William
Duro Metal Products Co.
Patterson Bros.
Snap-On Tools, Inc.
Williams & Co., J. H.
X-acto Crescent Products Co., Inc.

PLYWOOD AND VENEER
Brodhead-Garrett Co.
Craftsman Wood Service Co.
Douglas Fir Plywood Assn.
Giles & Kendall
Paxton Lumber Co., Frank
Plasticast Co.
Veneer Lumber & Plywood Co.

POLISHING CLOTHS
Dixon, Inc., William
Plasticast Co.

PORTABLE ELECTRIC DRILLS
Black & Decker Mfg. Co.
Delta Mfg. Co.
Millers Falls Co.
Patterson Bros.
Plasticast Co.
Snap-On Tools, Inc.
Stanley Electric Tool Div.

PORTABLE METERS, INDICATING
Weston Electric Instrument Co.

PORTABLE WOODWORKING MACHINERY
Black & Decker Mfg. Co.
Boice-Crane Company
Delta Mfg. Co.
Patterson Bros.
Stanley Electric Tool Div.
Yates-American Machine Co.

POTTERY EQUIPMENT CLAY AND SUPPLIES
Craftools, Inc.
Electric Hotpack Co., Inc.
Plasticast Co.

PRINTING PRESSES
Challenge Machinery Co.
Chandler & Price
Rembrandt Graphic Arts Co., Inc.

PRINTSHOP EQUIPMENT AND SUPPLIES
Challenge Machinery Co.
Hamilton Mfg. Co.
Rembrandt Graphic Arts Co., Inc.
Rouse Co., H. B.

PROJECTS — BLUEPRINTS & CASTINGS
Designers Company
Pootatuck Corp.

PROJECTORS
Eastman Kodak Co.

PROTRACTORS
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Keuffel & Esser
Millers Falls Co.
Patterson Bros.
Post Company, Frederick
Starrett Co., The L. S.

PUBLISHERS
American Technical Society
Audel & Co., Theo.
Bergling, V. C.
Bennett Co., Chas. A.
Bruce Publishing Company
Delmar Publishers
Goodheart-Willcox Co., Inc.
Industrial Press
International Textbook Co.
McGraw-Hill Book Co., Inc.
McKnight & McKnight
Sams & Co., Inc., Howard M.

PUNCHES, CENTER, PRICK, AND SOLID
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Dixon, Inc., William
Patterson Bros.
Starrett Co., The L. S.

PUNCH PRESSES
O'Neil Irwin Mfg. Co.

R

RADIAL SAWS
Walker-Turner Div.

RADIO PARTS & EQUIPMENT
Allied Radio

RADIO TEST EQUIPMENT
Allied Radio
Electronic Instrument Co. (EICO)
Weston Electric Instrument Co.

REAMERS
Chicago Latrobe Twist Drill Works

REFRIGERATION EQUIPMENT
Curtis Mfg. Co.

RESINS, LIQUID
Castolite Co., The

RESISTANCE BOXES, PLUG AND DIAL
Ohmite Mfg. Co.
Weston Electric Instrument Co.

REVOLVING STORAGE BINS
Parent Metal Products, Inc.

REVOLUTION COUNTERS
Brown & Sharpe Mfg. Co.

RHEOSTATS
Allied Radio Corp.
Ohmite Mfg. Co.

ROLLERS, METALWORKING
O'Neil Irwin Mfg. Co.
Plasticast Co.

ROUTERS, PORTABLE AND STATIONARY
Brodhead-Garrett Co.
Chicago Latrobe Twist Drill Works
DeWalt Products Co.
Duro Metal Products Co.
Patterson Bros.
Stanley Electric Tools
X-acto, Inc.
Yates American Machine Co.

RULERS, DRAFTING
Universal Drafting Machine Corp.

RULES, MACHINISTS' STEEL
Brown & Sharpe Mfg. Co.
Starrett Co., The L. S.

FREE!

THIS BIG ILLUSTRATED
LEATHERCRAFT CATALOG

There is no finer source of materials for Leathercraft projects of all kinds . . . easy-to-assemble kits to enable beginners to make billfolds, gloves, purses, belts and other attractive items . . . top quality tooling and carving leathers for advanced craftsmen. Also complete line of Leathercraft tools, accessories, supplies and instruction books.

ATTENTION
METALCRAFT
HOBBYISTS

Here is a comprehensive illustrated catalog from which you can make your selection of aluminum and copper in sheets and shapes for many projects; copper, aluminum and brass foil for metal tooling; kilns, colors and kits for metal enameling; instruction books, tools and accessories for metalcraft of all kinds.

SEND TODAY FOR EITHER OR BOTH FREE CATALOGS

J. C. LARSON CO.
820 S. TRIPP AVE., DEPT. 5613
CHICAGO 24, ILLINOIS

Two Valuable and Interesting Crafts:
BOOKBINDING & RUBBER STAMP MAKING

A full stock of equipment and supplies to meet the demands of all public and private institutions.
WRITE FOR FREE CATALOG AND INSTRUCTIVE MATERIALS.

G. A. PRATT COMPANY
1108 W. Chicago Ave. East Chicago, Ind.

LAMP PARTS and ELECTRICAL SUPPLIES

Send For FREE Catalogue

Prompt and Courteous Service
Discounts Available

L. H. KASSEL & CO.
208 T & P Terminal Whse. Bldg.
Ft. Worth, Texas

SHOP EQUIPMENT NEWS

(Continued from page 102A)

A firmly welded core of electrical steel and the absence of moving iron core or adjustable air gaps, assure permanently quiet operation.

For easy handling by crane, or hoist, a sturdy lifting eye is provided. The welder can also be supplied with portable mounting.

Volume 5 presents d.c. generators and motors, a.c. generators and motors, and power control devices.

(For Convenience Circle Index Code 0316)

Descriptive Material

SOUTH BEND LATHE CELEBRATES 50TH ANNIVERSARY

Many new and improved products are introduced in a Golden Anniversary Catalog just published by South Bend Lathe Company, builders of precision machine tools since 1906. Attractively bound in a gold cover, the 80-page book covers the entire line of South Bend precision engine lathes, toolroom lathes, turret lathes, shapers, pedestal grinders, and drill presses.

Also shown for the first time are the new South Bend vertical spindle milling machine and a new 13-in. swing turret lathe. Attachments, chucks, tools, and accessories for all South Bend machine tools are included.

Specifications including capacities, floor space requirements, and shipping weights for all machines are clearly tabulated. This catalog will be free on request.

(For Convenience Circle Index Code 0317)

BOOKLET ON FOUNDRY FLASKS

The Sterling Wheelbarrow Company have published a helpful little brochure on "How to Select and Maintain Foundry Flasks."

The determination of flask size, depth of drag and cheek, and the construction of fabricated steel flasks, the handling of steel flasks, and the determination of how to clamp the flasks for pouring are all clearly explained.

A copy will be sent to readers upon request.

(For Convenience Circle Index Code 0318)

PACKAGED HARDWOODS FOR THE DO-IT-YOURSELF WOODWORKER

Retail lumberyards, hardware stores, and all businesses catering to the *Do-It-Yourself* trade, can offer fancy hardwoods, already packaged for over-the-counter sale.

The Veneer Lumber & Plywood Company, who have specialized in wholesaling hardwoods for over 35 years, announce this new service through retail lumberyards. One offering will be known as the Pattern Kit, in which the customer can purchase 5/16-in. finished lumber cut to convenient widths and lengths to make a particular pattern. They are offering over 25 attractive and exclusive patterns, ranging from a simple Fish Plaque to an elaborate Wall Cabinet. Each package

(Continued on page 106A)

MAKE BOWS and ARROWS
LARGE STOCK PREPUNCHED LEATHER PROJECT KITS
M-1 FLAT BOW BOOK shows how..$1.05
M-1½ FUN WITH BOW & ARROW.. .31
M-2 LEATHER LACING GUIDE.... .31
NEW 51th Anniversary 16 page catalogue in 3 colors now ready. Its free but, 10¢ to help cover cost, appreciated.

INDIANHEAD ARCHERY MFG. CO.
Box 303-SP LIMA, OHIO

PERMABOND®

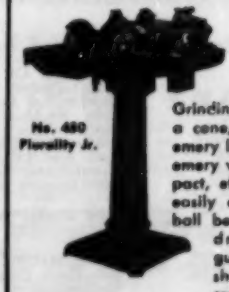
Permabond is a red-colored chemical weld used in Plumb Tool eyes to join heads and handles together permanently. It eliminates mechanical wedges which weaken handles. Provides a moisture-proof seal which prevents handle shrinkage. Minimizes handle breakage. Handles can't loosen in normal use.

For additional information write
FAYETTE R. PLUMB, Inc., Phila. 37, Pa.

PLUMB®
HAMMERS • HATCHETS • AXES • FILES

— PLEXIGLAS —
CLEAR & COLORED SHEET STOCK
CLEAR RODS — TUBING
CEMENTS BUFFING COMPOUND - TALLOW - CLEANER & POLISH
Prices F.O.B. Your School Sent by Return Mail
When Writing Advise Your Exact Requirements — PLEASE
McCLARIN PLASTICS HANOVER, PA. P.O. BOX 168N

TOOLS ALWAYS SHARP WITH PLURALITY OILSTONE TOOL GRINDERS



NOW AVAILABLE IN 3 SIZES
No. 425 Plurality Sub Jr.
No. 450 Plurality Jr.
No. 475 Plurality

Grinding can be done on a cone, coarse or fine or emery leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

MUMMERT-DIXON CO.
HANOVER, PENNSYLVANIA
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

RULES, WOOD, BOXWOOD AND COMBINATION
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliot Co., B. K.
Gramercy Import Co., Inc.
Lufkin Rule Co.
Stanley Tools
Weber Company, F.

S

SAFETY GOGGLES
Brodhead-Garrett Co.
Patterson Bros.
Starrett Co., L. S.
Western Materials Co.

SANDERS, BELT
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Skil Corporation
Yates-American Machine Co.

SANDERS, COMBINATION
Atlas Press Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
Duro Metal Products Corp.
Oliver Machinery Co.
Patterson Bros.
Snap-On Tools, Inc.
Walker-Turner Co., Inc.
Yates-American Machine Co.

SANDERS, DISK, DRUM PORTABLE, ELECTRIC
Black & Decker Mfg. Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Kindt-Collins Co.
Millers Falls Co.
Oliver Machinery Co.
Patterson Bros.
Shopsmith
Skil Corporation
Snap-On Tools, Inc.
Stanley Electric Tools
Walker-Turner Co., Inc.
Yates American Machine Co.

SAW FILER
Foley Mfg. Co.
Oliver Machinery Co.
Patterson Bros.

SAW GUARDS
Brett-Guard Co.

SAW PRODUCTION FIXTURES
Brett-Guard Co.

SAW SETS
Brodhead-Garrett Co.
Foley Mfg. Co.
Millers Falls Co.
Patterson Bros.
Simonds Saw & Steel Co.
Stanley Tools
X-acto, Inc.

SAW TRIMMERS (PRINTING)
Rouse Co., H. B.

SAWS, CIRCULAR, BAND, AND HACK
Atlas Press Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Northfield Foundry & Mach. Co.
O'Neil Irwin Mfg. Co.
Patterson Bros.
Rouse & Co., H. B.
Starrett Co., L. S.
Walker-Turner Co., Inc.

SAWS, METALCUTTING
Boice-Crane Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., William
L-W Chuck Co.
Millers Falls Co.
Patterson Bros.
Racine Tool & Machine Co.
Starrett Co., The L. S.
Walker-Turner Div.

SAWS, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Dalton Mfg. Co.
Millers Falls Co.
Patterson Bros.
Skil Corporation
Stanley Electric Tools

SCALES, DRAFTING
Universal Drafting Machine Co.

SCHOOLS
Bradley University
Colorado A & M College
Milwaukee School of Engineering
New York University School of Educ.
Oregon State Agricultural College
Oswego State Teachers College
Pennsylvania State College
University of Minnesota
Wayne University
Western Michigan College

SCREW CLAMPS
Adjustable Clamp Co.
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Patterson Bros.
Williams & Co., J. H.

SCREW DRIVERS
Brodhead-Garrett Co.
Duro Metal Products Corp.
Greenlee Tool Co.
Irwin Auger Bit Co.
Millers Falls Co.
North Brothers Mfg. Co.
Patterson Bros.
Snap-On Tools, Inc.
Stanley Tools
Williams & Co., J. H.
X-acto, Inc.

SCREW DRIVERS, ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Millers Falls Co.
Skil Corporation
Stanley Electric Tools

SCROLL SAWS
Brodhead-Garrett Co.
Boice-Crane Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Patterson Bros.

SEALERS AND FINISHES
General Finishes Sales & Service Co.
Patterson Bros.
Plasticast Co.
Veneer Lumber & Plywood Co.

SHAPER ATTACHMENTS
Patterson Bros.
Plasticast Co.

SHAPERS, ELECTRIC
Brodhead-Garrett Co.
DeWalt Products Corp.
Patterson Bros.
Plasticast Co.
Stanley Electric Tool Co.

SHAPERS, METAL
Atlas Press Co.
Brodhead-Garrett Co.
Logan Engineering Co.
Patterson Bros.
Plasticast Co.
Pootatuck Corp.
Sheldon Machine Co., Inc.
South Bend Lathe Works
Williams & Co., J. H.

SHAPERS, WOODWORKING
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Logan Engineering Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Plasticast Co.
Stanley Electric Tools
Walker-Turner Co., Inc.
Yates-American Machine Co.

SHEARS AND SCISSORS, FOR CUTTING METAL
Berkroy Products, Inc.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Plasticast Co.
Snap-On Tools, Inc.
Stanley Electric Tool Div.

SHEET METAL EQUIPMENT AND SUPPLIES
Berkroy Products, Inc.
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
O'Neil Irwin Mfg. Co.
Patterson Bros.
Plasticast Co.

SILK SCREEN PROCESS
Plasticast Co.

SILVERSMITHS' TOOLS AND SUPPLIES
Dixon, Inc., William
Metal Crafts Supply Co.
Patterson Bros.
Plasticast Co.

SKETCH BLOCKS
Dietzgen Co., Eugene
Elliott Co., B. K.
Weber Co., F.

SLIDE RULES
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Keuffel & Esser
Post Company, Frederick
Weber Co., F.

SOLDERING BENCHES
Parent Metal Products, Inc.
Patterson Bros.

SOLDERING FURNACES
American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Plasticast Co.
Sunbeam Corp.

SOLDERING IRONS, ELECTRIC
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Plasticast Co.
Snap-On Tools, Inc.
Stanley Tools

SOLDERING SOLUTIONS
Brodhead-Garrett Co.
Dixon, Inc., William
Kester Solder Co.
Patterson Bros.
Plasticast Co.
Ruby Chemical Company

SOLDERS, ALL KINDS
Brodhead-Garrett Co.
Dixon, Inc., William
Kester Solder Co.
Patterson Bros.
Plasticast Co.
Ruby Chemical Company

SPINNING EQUIPMENT AND TOOLS
Atlas Press Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Plasticast Co.

SPOKESHAVES
Brodhead-Garrett Co.
Patterson Bros.
Plasticast Co.
Stanley Tools

SQUARES, BEVEL
Brodhead-Garrett Co.
Patterson Bros.
Rouse & Co., H. B.
Stanley Tools
Starrett Co., The L. S.

SQUARES, COMBINATION
Millers Falls Co.
Patterson Bros.
Starrett Co., The L. S.

SQUARES, FRAMING, MITER, TRY
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Dixon, Inc., William
Lufkin Rule Co.
Patterson Bros.
Rouse & Co., H. B.
Stanley Tools
Starrett Co., The L. S.

STAINLESS STEEL PHOTO SINKS, TANKS, & TRAYS
P & H Sales Corp.

STAINS
Brodhead-Garrett Co.
General Finishes Sales & Service Co.
Larson Co., J. C.
Patterson Bros.
Plasticast Co.

STARTERS, MOTOR, Electric
Brodhead-Garrett Co.
DeWalt Products Corp.
Rouse & Co., H. B.

STEEL RULES
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Lufkin Rule Co.
Millers Falls Co.
Patterson Bros.
Rouse & Co., H. B.
Snap-On Tools, Inc.
Starrett Co., The L. S.

STEEL SQUARES
Brodhead-Garrett Co.
Lufkin Rule Co.
Patterson Bros.
Rouse & Co., H. B.
Stanley Tools
Starrett Co., The L. S.

STENCILS, SILK SCREEN
Brodhead-Garrett Co.
Plasticast Co.

STOOLS, DRAFTING
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Engineering Mfg. Co.
Hamilton Mfg. Co.
Parent Metal Products, Inc.
Stoner Wood Products Co.
Weber Co., F.

STORAGE BATTERY TESTING INSTRUMENTS
Brodhead-Garrett Co.
Weston Electric Instrument Co.

SWITCHBOARDS
Brodhead-Garrett Co.
Standard Electric Time Co.
Telephone Engineering Co.
Weston Electric Instrument Co.

SWITCHBOXES
Brodhead-Garrett Co.

SWITCHES, SAFETY & LOCK
Brodhead-Garrett Co.

SWITCHES, REVERSING
Brodhead-Garrett Co.
Williams & Co., J. H.

SWITCHES, ROTARY TYPE
Ohmite Mfg. Co.

SWITCHES, SNAP, PUSH BUTTON, AND PLUG
Allied Radio Corp.
Brodhead-Garrett Co.

T

TACHOMETERS, ELECTRIC
Standard Electric Time Co.
Weston Electric Instrument Co.

TAPE, MEASURING
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Keuffel & Esser
Lufkin Rule Co.
Patterson Bros.
Post Company, Frederick
Starrett Co., The L. S.
Weber Company, F.

TAPS AND DIES
Brodhead-Garrett Co.
Patterson Bros.
Plasticast Co.
Snap-On Tools, Inc.

T SQUARES
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Engineering Mfg. Co.
Starrett Co., The L. S.
Weber Co., F.

TELEPHONE PARTS
Telephone Engineering Co.

TENONERS
DeWalt Products Corp.
Greenlee Tool Co.
Oliver Machinery Co.
Patterson Bros.
Powermatic Machine Co.
Yates-American Machine Co.

TEST EQUIPMENT, ELECTRICAL
Allied Radio Corp.
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Standard Electric Time Co.
Telephone Engineering Co.
Weston Electric Instrument Co.

THREAD-CUTTING TOOLS
Armstrong Bros. Tool Co.
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
South Bend Lathe Works
Williams & Co., J. H.

TONGS
Brodhead-Barrett Co.
Dixon, Inc., William
Patterson Bros.
Stanley Tools
Williams Co., J. H.

TOOL AND CUTTER-GRINDER ATTACHMENTS
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
DeWalt Products Corp.
Mummert-Dixon Co.

TOOL BITS
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Chicago Latrobe Twist Drill Works
Patterson Bros.
South Bend Lathe Works
Whitman & Barnes

TOOL CHARTS
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Lufkin Rule Co.
Stanley Tools

TOOL GRINDERS, ELECTRIC, OILSTONE
Atlas Press Co.
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Dumore Company, The
Millers Falls Co.
Mummert-Dixon Co.
Patterson Bros.
South Bend Lathe Works
Stanley Electric Tools

TOOL HOLDERS
Armstrong Bros. Tool Co.
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Parent Metal Products, Inc.
Patterson Bros.
South Bend Lathe Works
Williams & Co., J. H.

TOOL ROOM GRINDERS
Atlas Press Co.
Blount Co., J. G.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Patterson Bros.
South Bend Lathe Works
Stanley Electric Tool Div.

TORCHES, GAS
Dixon, Inc., Wm.
Johnson Gas Appliance Co.
Patterson Bros.

TRACING PAPER AND CLOTH
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Keuffel & Esser
Post Company, Frederick
Weber Co., F.

TRAINING MATERIALS, AUTOMOTIVE ELECTRICITY
Delco-Remy Div., General Motors Corp.

TRIANGLES
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Elliott Co., B. K.
Engineering Mfg. Co.
Weber Co., F.

TYPE GAUGES
Challenge Machinery Co.
Lufkin Rule Co.
Rouse Co., H. B.

U

UNIT HEATERS
American Air Filter Co.

UNIT VENTILATORS
American Air Filter Co.

UNIVERSAL BOX ANGLES
Challenge Machinery Co.

UNIVERSAL HANDPRESS
Rembrandt Graphic Arts Co., Inc.

Everything for your Mechanical Drawing Department

WEBER

DRAWING MATERIALS
DRAWING INSTRUMENTS
DRAFTING ROOM FURNITURE

Descriptive data, on request

F. WEBER CO.
PHILADELPHIA 23, PA.
St. Louis 1, Mo. Baltimore 1, Md.

Patronize Your Nearest Weber Dealer

What's your Interest? ALLCRAFTS SUPERMART
WRITE TODAY!

Special experience since 1910 to help you answer every need, in all crafts! Leathercrafts - Metal craft - Woodenwares - Enameling - Ceramics - Art Supplies - Basketry - Many others! Complete stocks - prompt delivery - reasonable.

GET BIG FREE NO. 16 CATALOG
60 BIG PAGES. Fascinating! One of the largest leather stocks in the country! Thousands of items, projects, kits to suit every interest in all crafts.
WRITE TODAY!

SAXCRAFTS Dept. IN-3
DIVISION OF SAX BROS., INC.
1111 North 3rd St., Milwaukee, Wisconsin

JEWELRY TOOLS • FINDINGS • SILVER
Quality Tools at the Lowest Price
JEWELRY CRAFT SUPPLY
P.O. Box 14 Forest Hills, N. Y.
Send for Latest Catalogue

CASTINGS FOR SCHOOL PROJECTS
Build Home Workshop Machines. Designed for ease in machining and top interest-instruction. Literature on DEPENDABLE CASTINGS free to teachers. Others 20¢.

DESIGNERS COMPANY
724 Monroe Ave. Racine, Wis.

KNOCKDOWN CEDAR CHEST
and Aromatic Red Cedar Lumber

WRITE FOR FREE PRICE LIST TODAY
GILES & KENDALL CO., Huntsville, Ala.

DESCRIPTIVE MATERIAL

(Continued from page 104A)

will contain the pattern and all the necessary lumber and hardware to do the complete job. In addition to the pattern kits, they will also have available larger packages of lumber in cherry, walnut, butternut, and white oak. For those wanting to make several items, the larger packages of lumber, packaged 10 ft. in a carton, will be more economical and the pattern can be purchased separately.

(For Convenience Circle Index Code 0319)

SHAPER CUTTING SPEED CHART

The Sales Service Machine Tool Company has published a shaper cutting speed chart which they will send to any reader who requests one.

(For Convenience Circle Index Code 0320)

REFERENCE CHART

The Frederick Post Company has compiled a combination conversion and decimal equivalent 17 by 22-in. chart listing inches to foot conversions plus metric equivalents on one side and standard decimal equivalents on the other.

The chart may be obtained free.

(For Convenience Circle Index Code 0321)

NEW PLUMB COMPANY CATALOG

Fayette R. Plumb, Inc., in its current catalog, illustrates all items manufactured by the firm and gives a complete description of each item.

The catalog also describes two of the latest developments of the Plumb Line. One of them is the "Permabond" assembly method they have adopted for locking hammer, hatchets, and ax heads to their respective handles. It is a chemical weld that binds the head to the handle without needing mechanical wedges.

The other is the Plumb F-55 Hammer with a nonbreakable Fiberglas handle.

(For Convenience Circle Index Code 0322)

BOOKLET ON LUMBER AND PLYWOOD

"How to Specify and Buy Industrial Arts Lumber and Plywood" is a service publication of Frank Paxton Lumber Company. It is paper covered, 36 pp., 4 by 8¼ in., 25 cents postpaid.

A booklet aimed at simplifying grades, lumber terms and practices. Explains the

(Continued on page 108A)

New Imported
CARVING TOOLS
HOBBYCRAFT SETS
FINEST GERMAN STEEL
Complete Line of Chisels, Gouges & Parting Tools in Straight, Long Bend, Spoon, Back Bend & Fish Tail. Over 30,000 Tools in Stock. Liberal Discounts to Schools & Dealers.
FREE 8 Page Folder

FRANK MITTERMEIER (Est. 1936)
3577 E. Tremont Ave. New York 65, N.Y.

FURNITURE
• METAL LEGS
• WOOD LEGS
• FURNITURE FRAMES
SEND FOR DESIGN FOLDER AND PRICES

PHILLIPS FURNITURE CO.
2564 FON DU LAC • EAST PEORIA, ILLINOIS

The IMPROVED TAPERED DRILL FOR INTERNAL CARVING IN PLASTICS

Hand ground, fast cutting, high speed steel with sharp points. Standard lengths and stub (1½"), both in regular and high spiral for 1/16", 3/32", and 1/8" collets and Jacobs chuck. List price 75¢ up. Consult your School Supplier or write direct.

JOBBER INQUIRIES INVITED
ELBAR PRODUCTS
2348 E. 17th St. Brooklyn 29, N. Y.

THE Laszlo UNIVERSAL HANDPRESS $186.00

The unique all-around printing press. Prints wood block - linoleum - plastic and metal plate etching — Lithographs - set type - bromoil. Interchangeable beds. Pressure adjustable from light to heaviest as for fine etchings.

DETAILED INSTRUCTION BOOKLETS FURNISHED WITH PRESS.

Write for Catalog
REMBRANDT GRAPHIC ARTS CO., INC.
STOCKTON, NEW JERSEY

$2.95 EACH OR 2 FOR $5.00!

Genuine Telephone Company Upright Telephones complete with cords, in tested and guaranteed condition with 50 ft. of wire, intercommunication instructions. Complete line of telephone and parts, dial, magneto, intercommunication, etc. Write for free list. All shipments F.O.B. Simpson, Pa. 50% deposit required on all C.O.D. orders.

TELEPHONE ENGINEERING CO.
Dept. 31A6 Simpson, Pa.

FURNACES for heat treating, melting, etc.

AMERICAN GAS FURNACE COMPANY

MANY PRACTICAL PROJECTS FOR SCHOOL SHOPS

Complete sets of castings for building millers, shaper, lathes, accessories, also small tools; all projects of intense group-instructor interest for the average school shop.

CASTINGS AND PLANS

Write for FREE catalog and sample drawing.

POOTATUCK CORP.
40 Old Stratford Rd., Shelton, Conn.

UPHOLSTERY SUPPLIES
Brodhead-Garrett Co.
Upholstery Supply Co.

V

V-BLOCKS
Challenge Machinery Co.
Patterson Bros.

VALVE GRINDING EQUIP.
Black & Decker Mfg. Co.
Snap-On Tools, Inc.
South Bend Lathe Works

VENEER
Brodhead-Garrett Co.
Craftsman Wood Service Co.
Giles & Kendall
Plasticast Co.

VISES, BENCH, BLACKSMITH
Atkins & Co., E. C.
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Desmond-Stephan Mfg. Co.
Dixon, Inc., William
Millers Falls Co.
Morgan Vise Co.
North Bros. Mfg. Co.
Parent Metal Products, Inc.
Patterson Bros.
Stanley Tools

VISES, MACHINE, METAL-WORKING
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Columbian Vise & Mfg. Co.
Desmond-Stephan Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., William
Foredom Electric Co.
L-W Chuck Co.
Morgan Vise Co.
Nichols-Morris Corp.
North Bros. Mfg. Co.
Parent Metal Products, Inc.
Patterson Bros.
South Bend Lathe Works
Wilton Tool Mfg. Co., Inc.

VISES, PIPE, WOODWORKERS'
Atlas Press Co.
Brodhead-Garrett Co.
Columbian Vise & Mfg. Co.
Desmond-Stephan Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., William
Kindt-Collins Co.
Morgan Vise Co.
Oliver Machinery Co.
Parent Metal Products, Inc.
Patterson Bros.
Stanley Tools
Wilton Tool Mfg. Co., Inc.

VOLTMETERS
Brodhead-Garrett Co.
Electronic Instrument Co. (EICO)
Weston Electric Instrument Co.

W

WELDING EQUIPMENT, ELECTRIC
Brodhead-Garrett Co.
Delta Mfg. Co.
Linde Air Products Co.
Marquette Mfg. Co.

WHITE PRINTING MACHINES
P & H Sales Corp.

WOOD FINISHING MATERIALS
Brodhead-Garrett Co.
Craftsman Wood Service Co.
General Finishes Sales & Service Co.
Patterson Bros.
Plasticast Co.
Veneer Lumber & Plywood Co.

WOOD PROJECT MATERIAL
Castolite Co., The
Paxton Lumber Co., Frank
Plasticast Co.
Veneer Lumber & Plywood Co.

WOOD-TURNING LATHES
Atlas Press Co.
Blount Co., J. G.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Plasticast Co.
Walker-Turner Co., Inc.
Yates-American Machine Co.

WOODWORKING MACHINES, COMBINATION
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Euro Metal Products Corp.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Pootatuck Corp.
Shopsmith
Stanley Electric Tools

WOODWORKING SHAPERS
Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Greenlee Tool Co.
Northfield Foundry & Machine Co.
Oliver Machinery Co.
Patterson Bros.
Stanley Electric Tools
Walker-Turner Co., Inc.
Yates-American Machine Co.

WOODWORKING TOOLS AND SUPPLIES
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Cincinnati Lathe & Tool Co.
Connecticut Valley Mfg. Co.
Craftsman Wood Service Co.
DeWalt Products Corp.
Dixon, Inc., William
Duro Metal Products Corp.
Greenlee Tool Co.
Kindt-Collins Co.
Morgan Vise Co.
Oliver Machinery Co.
Patterson Bros.
X-acto Crescent Products Co.
Yates-American Machine Co.

WORK BENCHES
Challenge Machinery Co.
Craftools, Inc.
Dixon, Inc., William
Patterson Bros.
Stoner Wood Products Co.

WRENCH, IMPACT — Portable, Electric
Millers Falls Co.

WRENCHES, Box, Tap, Torque, Ignition, Open End, Etc.
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Duro Metal Products Corp.
Patterson Bros.
Snap-On Tools, Inc.
Williams & Co., J. H.

KNOCKDOWN CEDAR CHESTS

Write for Free Price List Today

BEDFORD LUMBER CO.
SHELBYVILLE, TENN.

A BUYER'S GUIDE
FOR THE ART AND INDUSTRIAL ART INSTRUCTOR
Send for Our Free
CAREFULLY INDEXED
96 Page Catalogue
LISTING SUPPLIES & REFERENCE MATERIAL IN MOST ALL LINES OF ARTS & CRAFTS
Wood Whittling & Carving - Raffia - Ceramics - Leather - Metal - Jewelry - Shellcraft - Flexcraft - Plasti-Glass - Textile-Painting - Artists Supplies - Finger-Painting - Block Printing - Knitting - Flytying - Glass Etching - And Many Others.
CRAFTERS of PINE DUNES
MILLER ROAD OOSTBURG, WIS.

SOMETHING NEW IN SHOP FURNITURE

1. Four-station workbench with tools for elementary and junior high schools.
2. Four-station drafting table for the general shop.
3. Finishing cabinets and saw-bench.
4. Anvil base with concealed tool storage.
5. Sheet metal stake stand and tables.
6. Bench tool cabinet for four-station woodwork bench.
7. DeLuxe drafting table with complete equipment storage.

Write today for literature to:

Stoner Wood Products Co.
Charleston, Illinois

LOOMS, Table and Foot

REED, RAPHIA, HANDICRAFT SUPPLIES

SEND FOR CATALOG

J. L. HAMMETT CO., CAMBRIDGE, MASS.

MAKE SURE YOU HAVE
DonJer's New School Catalog of Pre-Selected Project Equipment and Supplies
HERE IS YOUR DonJer CATALOG
WRITE FOR YOUR FREE COPY
DONJER PRODUCTS COMPANY

DESCRIPTIVE MATERIAL

(Continued from page 106A)

theory of grades in hardwoods and softwoods, and describes the grades in nontechnical terms. Suggests woods suitable for elementary, intermediate, and advanced work. Details correct methods of writing lumber and plywood specifications; how to avoid technical discrepancies in specification writing which cause errors in procurement. The information in this booklet is based upon 35 years of practical experience in the field.

(For Convenience Circle Index Code 0323)

PROTO PLUG-HOLDING SOCKETS FOR SPARK PLUGS

Design of two spark plug sockets with a special rubber insert for holding plugs has been announced by the Plomb Tool Company. The patented rubber insert holds a spark plug securely in the socket and thus provides a means of removing and installing plugs quickly in the hard-to-reach places on many V-8 overhead valve engines. It also enables a user to change plugs without burning his hands on hot manifolds.

Socket No. 5026HP is for ⅜-in. drive and has a $^{13}/_{16}$-in. hex opening that turns the 14mm. spark plugs on most popular cars and many trucks. The other socket No. 5326HP has the same opening size, but is for ½-in. drive. Both have a ¼-in. plug at the top, which allows the socket to be turned with an open end or box wrench. The sockets are made of special alloy steel and are chrome plated.

Extensions of various lengths can be used with the sockets to reach otherwise inaccessible plugs on several V-8 engines. The sockets and extensions can be turned by any handle, including a ratchet-head or other type of torque wrench — recommended for all spark plugs and considered very important for the new gasketless plugs.

(For Convenience Circle Index Code 0324)

CHIP CARVING KIT

A new Chip Carving Kit has just been announced by Frank Mittermeier.

This kit includes: 2 glued wood frames 1½ in. wide (for 5 by 7, and 7 by 10-in. pictures), 2 sharp knives, practice wood and oil stone, plus complete instructions on *How to Carve with Design Chart*.

The hobby of chip carving requires no hard or tiresome effort, is fascinating and simple as A-B-C.

Mirror and picture frames, powder, and boudoir boxes, are but a few of the many practical and useful articles which can be made with the new Mittermeier Chip Carving Kit.

(For Convenience Circle Index Code 0325)

CRAFTSMEN
Illustrated handbooks on Designing, Engraving, Jewelry Making, Stone Setting, etc.
For information write
V. C. BERGLING, Publisher-Bookseller
P.O. Box 523, Coral Gables, Fla., U.S.A.

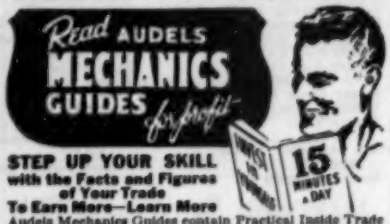
ELECTRO-TYPERS
Especially qualified to be of service to the school printshop.
Promptness and quality assured.
Forms returned same day received.
Badger - American Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St. Milwaukee, Wis.

GLUING WITH HOT GLUE

Is practical and economical for school shop and home use. Teach the boys what good glue can do by heating it in Sta-Warm electric glue pots. Cap. 1 to 12 qts. 110 V. A.C. Safe non-burning electric heat. Removable insert with ball brush-wiper, and lid if desired. Specify Sta-Warm glue melters.

Cut-away view showing low heating element completely covers sides and bottom of pot to maintain even heat distribution at low wattage.

STA-WARM ELECTRIC CO.
50 N. Chestnut St.
RAVENNA, OHIO



STEP UP YOUR SKILL with the Facts and Figures of Your Trade
To Earn More—Learn More

Audels Mechanics Guides contain Practical Inside Trade Information in handy form. Fully Illustrated. Easy to Understand. Highly Endorsed. Check book you want for 7 DAYS' FREE EXAM. Send No Money. Nothing to pay postman. ☐Carpentry $6 ☐Auto $4 ☐Oil Burners $1 ☐Sheet Metal $1 ☐Welding $1 ☐Refrigeration $4 ☐Plumbing $6 ☐Masonry $6 ☐Painting $2 ☐Radio $4 ☐Electricity $4 ☐Mathematics $2 ☐Steam Engineers $4 ☐Machinist $4 ☐Blueprint $2 ☐Diesel $2 ☐Drawing $1. If satisfied you pay only $1 a month until price is paid.
AUDEL, Publishers, Dept. A, 49 W. 23 St., N.Y. 10, N.Y.

METAL CRAFTS
Tools, Materials and Supplies

- **Hammers, anvils, enamels, etching materials, books and findings.**

Send 50¢ for our new catalog 1A. Payment credited on first $3.00 order.

METAL CRAFTS SUPPLY COMPANY
10 Thomas Street Providence, Rhode Island

QUANTITY DISCOUNTS
Huge discounts . . ranging from 10%-40% . . . are now offered on our complete stock of craft supplies. Send for our FREE catalog listing the latest materials, books, tools and ideas. Our quantity discount schedule will be included.
CRAFTSMAN SUPPLY HOUSE
SCOTTSVILLE 12, N.Y.

High Grade
Printing Inks

For SCHOOL PRINT SHOPS

COVERWELL INKS FOR QUALITY PRINTING

MARTIN DRISCOLL & CO.
610 Federal St. Chicago, Ill. Portland, Oregon 407 E. Michigan St. Milwaukee, Wis.

INDEX TO ADVERTISERS' PRODUCTS AND SERVICES

Advertisers in this index are given a key number in addition to the page number on which the advertisement appears. Refer to the advertisement for product or services available. Use the business reply card in requesting information from a number of advertisers.

Code No.		Page No.
30	ADJUSTABLE CLAMP COMPANY ..... *Clamps, Handscrews, Bar, "C," etc.*	18A
31	ALUMINUM CO. OF AMERICA ..... *Educational Aids*	81A
32	ALVIN & COMPANY ..... *Drafting Instruments & Supplies*	96A
33	AMERICAN GAS FURNACE CO. ..... *Heat-Treating Equipment*	106A
34	AMERICAN LEAD PENCIL CO. ..... *Pencils*	84A
35	AMERICAN TECHNICAL SOCIETY .... *Publishers*	94A
36	ARMSTRONG BROS. TOOL CO. ..... *Metalworking Tools & Tool Holders*	20A
37	ATLAS PRESS COMPANY, THE ..... *Woodworking & Metalworking Machine Tools*	8A-9A
38	AUDEL & CO., THEO. ..... *Publishers*	108A
39	BEDFORD LUMBER CO. ..... *Knockdown Furniture*	108A
310	BENNETT CO., INC., CHAS. A. ..... *Publishers*	67A
311	BERGEN ARTS & CRAFTS ..... *Jewelry Craft Supplies*	103A
312	BERGER SCIENTIFIC SUPPLIES CORP. *Drafting Instruments & Supplies*	88A
313	BERGLING, V. C. ..... *Publishers*	108A
314	BERKROT PRODUCTS, INC. ..... *Sheet Metal Tools*	74A
315	BLACK & DECKER MFG. CO. ..... *Portable Electric Tools*	11A
316	BLOUNT CO., J. G. ..... *Grinders & Lathes*	36A
317	BOICE-CRANE COMPANY ..... *Woodworking Machine Tools*	39A
318	BORDEN CO., THE ..... *Glue*	66A
319	BRADLEY UNIVERSITY ..... *School*	88A
319A	BRETT-GUARD CO. ..... *Safety Tool Saw Guard*	95A
320	BROADHEAD-GARRETT COMPANY ..... *Shop Equipment & Supplies*	90A
321	BROWN & SHARPE MFG CO. ..... *Machinery & Tools*	86A
322	BRUCE PUBLISHING CO., THE ..... *Publishers*	99A & 3rd cover
323	CADILLAC PLASTIC & CHEMICAL CO. *Plastics*	93A
324	CASTOLITE CO., THE ..... *Plastics*	68A & 69A
325	CHALLENGE MACHINERY CO. ..... *Printing Presses, Paper Cutters*	46A
326	CHANDLER & PRICE CO. ..... *Printing Presses, Paper Cutters*	89A
327	CHICAGO-LATROBE TWIST DRILL WORKS ..... *Tools, Drills*	98A
328	CINCINNATI MILLING MACHINE CO. *Metalworking Machine Tools*	13A
329	CINCINNATI TOOL COMPANY, THE .. *Clamps, Carriage & Screw*	96A
330	COLORADO A & M COLLEGE ..... *School*	91A
331	COLUMBIAN VISE & MFG. CO. ..... *Vises for Metal & Wood, Bench Screws*	14A
332	CONNECTICUT VALLEY MFG. CO. ... *Woodworking Tools*	102A
333	COPE PLASTICS, D. W. ..... *Plastics*	82A
334	COTTON-HANLON, INC. ..... *Lumber*	87A
335	CRAFTERS OF PINE DUNES ..... *Project Material*	108A
336	CRAFTOOLS, INC. ..... *Pottery Wheel*	66A
337	CRAFTSMAN SUPPLY HOUSE ..... *Project Material*	108A
338	CRAFTSMAN WOOD SERVICE CO. ... *Handicraft Supplies, Lumber*	87A
339	CROW ELECTRIC-CRAFT CORP. ..... *Electricity Experimental Kits*	41A
340	CUNNINGHAM CO., M. S. ..... *Safety Steel Stamps*	93A
341	CURTIS MANUFACTURING CO. ..... *Automotive Tools & Supplies*	25A
342	DAKE ENGINE COMPANY ..... *Arbor & Platen Presses*	30A
343	DELCO REMY DIVISION, GENERAL MOTORS CORPORATION ..... *Automotive Supplies*	37A
344	DELSOTE, INC. ..... *Bindery Equipment & Supplies*	96A
345	DELMAR PUBLISHERS ..... *Publishers*	102A
346	DELTA POWER TOOL DIV., ROCKWELL MFG. CO. ..... *Woodworking Machine Tools & Metalworking*	28A & 29A
347	DESIGNERS COMPANY ..... *Project Material*	106A
348	DESMOND STEPHAN MFG. CO. ..... *Vises*	47A
349	DeWALT, INC., SUB. AMERICAN MACHINE & FOUNDRY CO. ..... *Woodworking Machine Tools*	27A
350	DICK COMPANY, A. B. ..... *Mimeograph Duplicators*	21A
351	DIETZGEN COMPANY, EUGENE .. *Drafting Instruments & Supplies*	2nd cover
352	DIXON, INC., WILLIAM ..... *Art Metal Craft Tools*	46A
353	DONJER PRODUCTS ..... *Project Material*	108A
354	DOUGLAS FIR PLYWOOD ASSN. ..... *Plywood Association*	33A
355	DRISCOLL & CO., MARTIN ..... *Printing Inks*	108A
356	DURO METAL PRODUCTS CO. ..... *Woodworking Machine Tools*	22A
357	EAGLE PENCIL COMPANY ..... *Pencils*	75A
358	EASTMAN KODAK CO. ..... *Films, Projectors*	57A
359	ELBAR PRODUCTS ..... *Carving Drills for Plastics*	106A
360	ELECTRIC HOTPACK COMPANY, INC. *Ceramics Equipment & Supplies, Electric*	49A
361	ELECTRONIC INSTRUMENT CO. (EICO) *Electrical Equipment*	52A
362	ELLIOTT COMPANY, B. K. ..... *Drafting Materials*	63A
363	FOLEY LUMBER COMPANY, T. A. ... *Lumber*	85A
364	FOLEY MANUFACTURING CO. ..... *Saw Filing Equipment*	44A
365	FOREDOM ELECTRIC CO. ..... *Metalworking & Machine Vises, Plastic Carving Drills*	40A
366	FORMIT ..... *Ornamental Iron Work*	95A
367	GEARON COMPANY, THE ..... *Project Material*	95A
368	GENERAL FINISHES SALES & SERVICE CO. ..... *Wood Finishes*	103A
369	GILES AND KENDALL CO., INC. .... *Project Material*	106A
370	GOODHEART-WILLCOX CO., INC. ... *Publishers*	23A
371	GRAMERCY GUILD GROUP, INC. .... *Importers German Drawing Instr.*	60A
372	GREEN INSTRUMENT CO. ..... *Pantograph Engraver*	63A
373	GREENLEE TOOL CO. ..... *Hand Tools*	33A
374	HAMILTON MANUFACTURING CO. .. *Manual Training Equip. & Supplies.*	89A
375	HAMMETT COMPANY, J. L. ..... *Looms — Handicraft Supplies*	108A
376	HARDWOOD CORP. OF AMERICA ... *Lumber, Hardwood*	61A
377	HIGGINS INK CO., INC. ..... *Drawing Inks*	61A
378	HOSSFELD MANUFACTURING CO. ... *Metalworking Benders*	48A
379	INDIANHEAD ARCHERY & MFG. CO. *Project Material*	104A
380	INDUSTRIAL PRESS ..... *Publishers*	82A
381	IRWIN AUGER BIT CO. ..... *Auger Bits*	22A
382	JAM HANDY ORGANIZATION ..... *Visual Aids, Slide Films*	81A
383	JEWELRY CRAFT SUPPLY ..... *Jewelry Craft Supplies*	106A
384	JOHNSON GAS APPLIANCE CO. .... *Heat-Treating Furnaces*	79A
385	KALAMAZOO TANK & SILO CO. .... *Metal Cutting Band Saws*	18A
386	KASSEL & CO., L. H. ..... *Lamp Parts & Electrical Supplies*	104A
387	KEARNEY & TRICKER CORP. ..... *Milling Machines*	19A
388	KESTER SOLDER COMPANY ..... *Flux & Solders*	83A
389	KINDT-COLLINS CO. ..... *Pattern Lumber & Pattern Shop Supplies*	79A
390	LARSON CO., J. C. ..... *Project Material*	104A
391	LeBLOND MACHINE TOOL CO., R. K. ..... *Metalworking Machine Tools*	4th cover
392	LINDE AIR PRODUCTS CO. ..... *Welding Equipment*	100A
393	LOGAN ENGINEERING COMPANY ... *Metalworking Machine Tools*	6A
394	L-W CHUCK COMPANY ..... *Vises, Chucks, Hack Saws*	32A
395	MAYLINE CO. ..... *Drafting Room Equipment*	61A
396	MARQUETTE MANUFACTURING CO. .. *Welding Equipment*	35A
397	McCLARIN PLASTICS ..... *Plastics*	104A

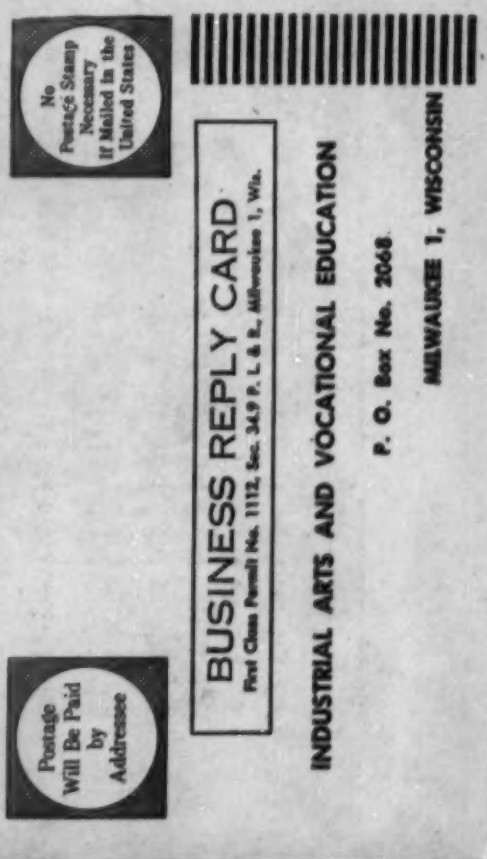
INDEX CONTINUED ON NEXT PAGE

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
First Class Permit No. 1112, Sec. 34.9 P. L. & R., Milwaukee 1, Wis.

Postage Will Be Paid by Addressee

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
P. O. Box No. 2068
MILWAUKEE 1, WISCONSIN


No Postage Stamp Necessary If Mailed in the United States
BUSINESS REPLY CARD
First Class Permit No. 1112, Sec. 34.9 P. L. & R., Milwaukee 1, Wis.
Postage Will Be Paid by Addressee
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
P. O. Box No. 2068
MILWAUKEE 1, WISCONSIN

Index to Advertisers—continued

Code No.		Page No.
3098	McGRAW-HILL BOOK CO., INC. *Publishers*	93A
3099	McKNIGHT & McKNIGHT *Publishers*	71A
3100	METALCRAFTS SUPPLY CO. *Plastic Material*	108A
3101	METAL GOODS CORPORATION *Handicraft Supplies*	80A
3102	MILLERS FALLS COMPANY *Hand & Power Tools for Wood & Metal*	24A
3103	MILWAUKEE SCHOOL OF ENGINEERING *School*	68A
3104	MISSENER MFG. COMPANY *Hack Saws*	80A
3105	MITTERMEIER, FRANK *Imported Woodworking Tools*	106A
3106	MORGAN VISE COMPANY *Vises for Metal & Wood*	17A
3107	MUMMERT-DIXON COMPANY *Grinders*	106A
3108	NEW YORK UNIVERSITY SCHOOL OF EDUCATION *School*	91A
3109	NICHOLS-MORRIS CORPORATION *Milling Machines*	73A
3110	NICHOLSON FILE COMPANY *Files & Rasps*	2A
3111	NORTHFIELD FOUNDRY & MACHINE CO. *Woodworking Machinery*	92A
3112	OHMITE MANUFACTURING CO. *Radio Parts, Electrical Equipment*	88A
3113	OLIVER MACHINERY CO. *Woodworking Machinery*	65A
3114	O'NEIL-IRWIN MFG. COMPANY 76A & 77A *Metal Crafts Tools & Supplies*	
3115	OREGON STATE COLLEGE *School*	91A
3116	PARENT METAL PRODUCTS, INC. *Metalworking & Woodworking Equipment*	46A
3117	PARKS WOODWORKING MACHINE CO. *Woodworking Machine Tools*	20A
3118	PATTERSON BROS. *Shop Supplies*	83A
3119	PAXTON LUMBER CO., FRANK *Lumber & Plywood*	87A
3120	PENNSYLVANIA STATE UNIVERSITY *School*	88A
3121	P & H SALES CORP. *Blue Printing & White Printing Machine*	63A-65A
3122	PHILLIPS FURNITURE CO. *Furniture for Shop Projects*	106A
3123	PITTSBURGH PLATE GLASS CO. *Wood Finishing Material*	73A
3124	PLASTIC PARTS & SALES *Project Material*	58A
3125	PLUMB, INC., PAYETTE R. *Hammers*	104A
3126	POOTATUCK CORP. *Precision Miter & Joint Cutter*	106A
3127	POST COMPANY, FREDERICK *Drafting Instruments & Supplies*	55A
3128	POWERMATIC MACHINE CO. *Special Machines & Machine Parts*	18A
3129	PRATT COMPANY, G. A. *Bookbinders Supplies*	106A
3130	QUEEN CITY MACHINE TOOL CO. *Buffers & Grinders*	40A
3131	RACINE HYDRAULICS & MACHINERY CO. *Metal Cutting Saws*	40A
3132	REMBRANDT GRAPHIC ARTS CO., INC. *Hand Presses*	106A
3133	ROGERS ISINGLASS & GLUE CO. *Glue*	83A
3134	ROUSE & CO., H. S. *Printshop Equipment*	86A
3135	RUBY CHEMICAL COMPANY *Solders*	87A
3136	SAMS & CO., INC., HOWARD W. *Publishers*	42A
3137	SAXCRAFTS, DIV. OF SAX BROS., INC. *Leather, Tools & Supplies*	106A
3138	SEELEY'S CERAMIC STUDIO *Ceramics*	87A
3139	SHELDON MACHINE CO., INC. *Metalworking Machine Tools*	4A
3140	SHOPSMITH *Woodworking Machine Tools*	31A
3141	SIMONDS SAW & STEEL CO. *Saws*	34A & 48A
3142	SNAP-ON TOOLS, INC. *Automotive Tools*	16A
3143	SOUTH BEND LATHE WORKS *Metalworking Machine Tools*	1A
3144	STACOR EQUIPMENT COMPANY *Drafting Tables & Boards*	63A
3145	STANDARD ELECTRIC TIME CO. *Electrical Equipment*	83A
3146	STANLEY TOOLS *Hand & Power Tools for Wood & Metal*	10A
3147	STARRETT CO., THE L. S. *Precision Measuring Instruments*	5A
3148	STA-WARM ELECTRIC COMPANY *Glue Pots*	108A
3149	STERLING WHEELBARROW CO. *Foundry Equipment*	92A
3150	STEWART CLAY CO. *Plastic Art Modeling Clay*	100A
3151	STONER WOOD PRODUCTS CO. *Drafting & Woodworking Tables*	108A
3152	STUECK, INC., W. WHITNEY *Beach Brakes, Do-It-Yourself Projects*	79A
3153	TELEPHONE ENGINEERING CO. *Telephone Parts & Equipment*	106A
3154	TOLERTON CO., THE *Drafting Tables*	58A
3155	UNITED WORLD FILMS, INC. *Films*	34A
3156	UNIVERSAL DRAFTING MACHINE CORPORATION, THE *Drafting Material*	61A
3157	UNIVERSITY OF MINNESOTA *School*	91A
3158	UPHOLSTERY SUPPLY CO. *Upholstery Supplies*	85A
3159	V & E MFG. COMPANY *Drafting Material*	58A & 62A
3160	VENEER LUMBER & PLYWOOD CO. *Lumber & Plywood, Project Material*	80A
3161	WALKER-TURNER DIV. (KEARNEY-& TRECKER CORP.) *Woodworking & Metalworking Machine Tools*	7A
3162	WAYNE UNIVERSITY *School*	88A
3163	WEBER COMPANY, F. *Drafting Instruments & Supplies*	106A
3164	WESTERN MATERIALS COMPANY *Furnaces & Foundry Supplies*	100A
3165	WESTERN STATES ENVELOPE CO. *Envelopes*	85A
3166	WESTON ELECTRICAL INSTRUMENT CO. *Electrical Measuring Instruments*	43A
3167	WHITMAN AND BARNES *Twist Drills, Boomers*	98A
3168	WILLIAMS & CO., J. H. *Woodworking & Metalworking Equipment*	98A
3169	WILTON TOOL MFG. CO. *Vises, Clamps*	12A
3170	WISCONSIN LABORATORIES, INC. *Paint Brush Protector*	100A
3171	X-ACTO, INC. *Project Material*	98A
3172	YATES-AMERICAN MACHINE CO. *Woodworking Machine Tools*	15A

SHOP EQUIPMENT NEWS

0301	DOALL CO. *DoAll Torque Screw Driver and Special V-Blocks and Pins*	92A
0302	J. D. WALLACE & CO., INC. *New Model Table Saw*	92A
0303	CINCINNATI MILLING MACHINE CO. *Contourmaster Milling Machine*	92A
0304	GEORGE SCHERR CO. *New Bench Micrometer*	92A
0305	BROWN & SHARPE CO. *"Super Vernier" Height Gauges*	92A
0306	BOICE-CRANE CO. *Master-Monotrol 10-in. Tilting Arbor Saw*	94A
0307	LIMA ELECTRIC MOTOR CO. *New Fan-Duty Motors*	94A
0308	WETZLER CLAMP CO. *Wetzler 'Drill Press Clamp*	94A
0309	FREDERICK POST CO. *Ratolite for Reproducing Drawings*	96A
0310	BLACK & DECKER MFG. CO. *Heavy-Duty Saw Table*	96A
0311	REMBRANDT GRAPHIC ARTS CO. *Laszlo Universal Handpress*	96A
0312	ELECTRONIC INSTRUMENT CO., INC. *New 2-Watt HF Amplifier Kit*	98A
0313	NIAGARA MACHINE AND TOOL WORKS *Deep Throat Presses (Ballistic 61C)*	100A
0314	PICKETT & ECKEL, INC. *Green-Yellow Eye-Saver Slide Rule*	100A
0315	STONER WOOD PRODUCTS CO. *New Drafting Table*	109A
0316	HOBART BROTHERS CO. *Hobart Electric Welder*	102A
0317	SOUTH BEND LATHE CO. *50th Anniversary Catalog*	104A
0318	STERLING WHEELBARROW CO. *Booklet on Foundry Flasks*	104A
0319	VENEER LUMBER & PLYWOOD CO. *Packaged Hardwoods*	104A
0320	SALES SERVICE MACHINE TOOL CO. *Shaper Cutting Speed Chart*	106A
0321	FREDERIC POST CO. *Reference Chart*	106A
0322	PAYETTE R. PLUMB, INC. *New Catalog*	106A
0323	FRANK PAXTON LUMBER CO. *Booklet on Lumber and Plywood*	106A
0324	PLOMB TOOL CO. *Proto Plug-Holding Sockets for Spark Plugs*	108A
0325	FRANK MITTERMEIER *Chip Carving Set*	108A

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
400 North Broadway, Milwaukee 1, Wis. March, 1956

Please ask the advertiser, indicated by the key number encircled, to send information offered in the advertisement.

| | | |

Auto Mechanics Texts

The New Book for Driver Education Courses —

LEARNING TO DRIVE

Harold S. Bostwick, Hyman M. Boodish, Benjamin Rodini

In the concise and popular lesson-unit or job-sheet form, here is all the information on the skill of driving needed by the beginning motorist. This inexpensive course offers plenty of material for work both in the classroom and behind the wheel — material that students can make use of while learning. Every phase of good driving is set forth in non-technical terms: from safe habits and traffic regulations to maneuvering both in the city and on the highway. A separate section explains the parts of the car and what they do. Features a battery of charts, diagrams, photographs, drawings, pupil activities, and tests. *Economically priced — 96 cents*

1955 Revised Edition ---

AUTOMOTIVE ESSENTIALS

Ray F. Kuns

Now incorporating text changes and new photographs of the late model cars, this 1955 edition of the basic book in auto-mechanics will equip high school students to select, operate, and repair modern automobiles intelligently. As in previous editions, the book treats the car as a unit and then breaks it into minor parts until each component is explained and illustrated. $3.48

AUTOMATIC TRANSMISSIONS

Ray F. Kuns

A widely-used text that presents the theory, maintenance, servicing, testing, tools, and repairing of all automatic transmissions used in modern automobiles. It uses a specific make transmission to represent all transmissions of a similar type and design. *$4.00*

AUTO MECHANICS

Ray F. Kuns

Complete and modern, this series offers a flexible course in the theory of auto-mechanics and maintenance. Illustrated with many photographs, drawings, and diagrams.

Book One — THE ENGINE (newly revised)	**$1.65**
Book Two — COOLING, LUBRICATION, AND FUEL SYSTEM	**1.25**
Book Three — AUTOMOTIVE ELECTRICITY	**1.25**
Book Four — THE POWER FLOW	**1.25**
Book Five — CHASSIS UNITS	**1.25**
Book Six — FRAME AND BODY MAINTENANCE	**2.50**

AUTOMOTIVE SERVICE

Ray F. Kuns

Volume I 1954 Revised Edition. Modern material and a wealth of illustrations cover the component parts of the automobile and describe all the common service station jobs. Contains information on jobs for frames, steering mechanism, care of bearings, gears, axles, and the like. $4.95

Volume II 1953 Revised Edition. Profusely illustrated, this second volume covers service on engines, carburetors, pistons, valves, cylinder and crankshaft forms, camshafts, oil pumps, and other parts of power plants, plus cooling and oiling, fuel, ignition, and auto electrical systems. $4.95

AUTO-MECHANICS STANDARD-PRACTICE JOB SHEETS

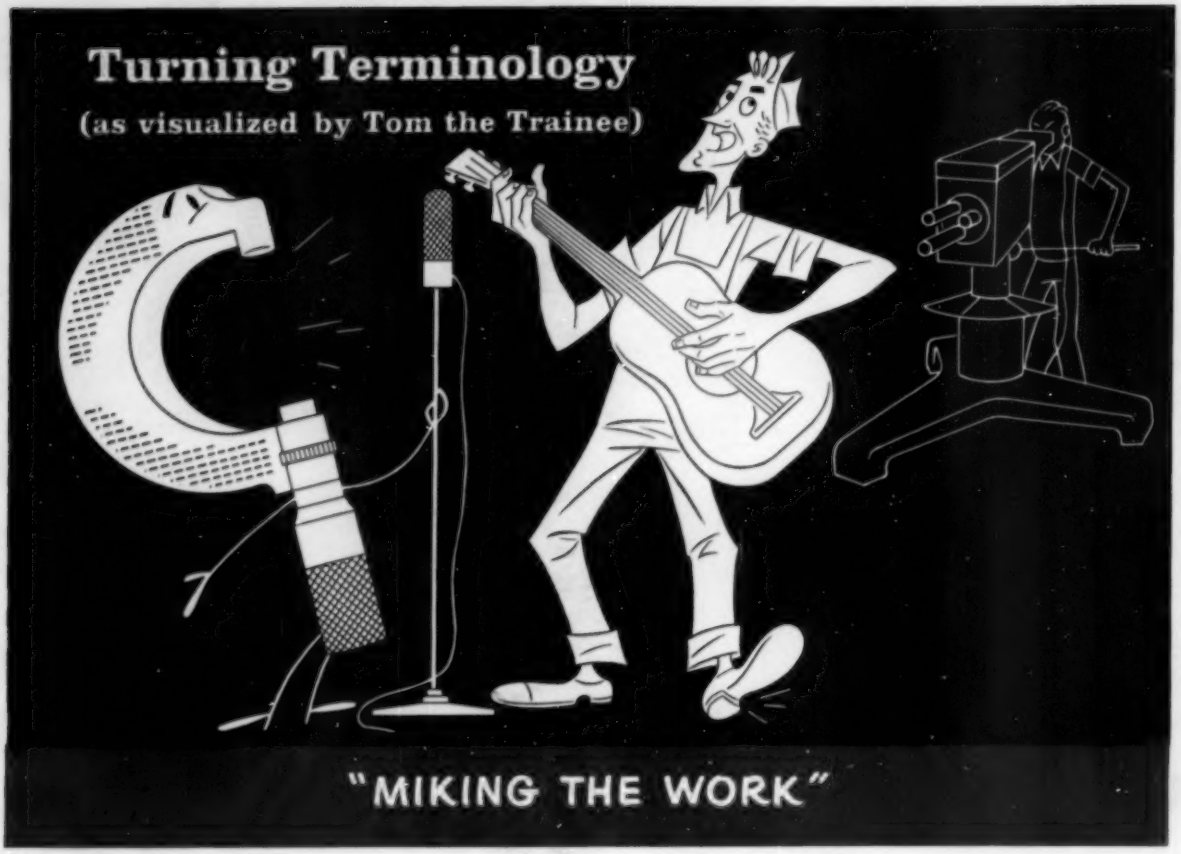
Harold S. Bostwick and William H. Yergy

Practical job experience in auto-mechanics is the aim of these skillfully prepared job sheets. Divided into four books, the 126 units list tools required, special instructions, procedures, and text references for each job. *48 cents each*

BE SURE TO VISIT OUR EXHIBIT
at the
1956 AIAA CONVENTION!

Examination copies of the above books available for 30 days' study.

The Bruce Publishing Co. 400 BRUCE BUILDING MILWAUKEE 1, WISCONSIN

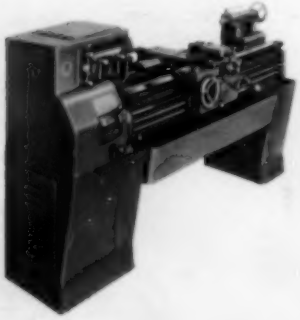


Tom will get plenty of practice reading the thousandths scale on his micrometer when you put him to work on a LeBlond Regal lathe. He'll get used to turning out jobs that call for big-lathe precision, appreciate the way Regals work to close tolerances. That's what makes LeBlond Regals a natural in the classroom — and in thousands of machine shops from coast to coast. They give a long life of precision you'd expect from a much higher-priced machine.

What makes precision? Basically, rigidity of the work and rigidity of the tool. The new Regal headstock design incorporates a big-lathe spindle supported by three bearings, two Timken and one ball bearing. The new tailstock is extra rigid, gives you positive spindle clamping. So, work turns true, even when you're taking a big bite!

The tool is held rigidly, too, thanks to the full 18¾" carriage length on the ways, and the double-wall single-piece apron casting that protects clutch and gear train from dirt and misalignment. Finally, a scientifically designed bed that gives all these elements maximum support. The bedways are hardened and ground, are fitted to the compensating veeway principle that gives a better distribution of forces for long-time accuracy and minimum wear. The same principle we incorporate in the biggest lathes we build!

As a result, you get rigidity and precision that last and last — even when inexperienced hands put them to the test. That's the comfort of having a shop full of LeBlond Regals. Get all the facts today. Call your nearby LeBlond Distributor or write.



The R. K. LeBlond Machine Tool Company

Cincinnati 8, Ohio
World's Largest Builder of a Complete Line of Lathes for More than 69 Years

LeBLOND of Cincinnati